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WALLOPS ISLAND, VIRGINIA

RANGE REFERENCE ATMOSPHERE
0-70 KM ALTITUDE

JULY 1983

METEOROLOGY GROUP
RANGE COMMANDERS COUNCIL

WHITE SANDS MISSILE RANGE
KWAJALEIN MISSILE RANGE
YUMA PROVING GROUND

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FOREWORD

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WALLOPS ISLAND, VIRGINIA

RANGE REFERENCE ATMOSPHERE
0-70 KM ALTITUDE

July 1983

Prepared by

Range Reference Atmosphere Committee
Meteorology Group
Range Commanders Council

Published by

Secretariat
Range Commanders Council
White Sands Missile Range, New Mexico 88002

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LIST OF ORGANIZATION ACRONYMS

AD	Armament Division
AFFTC	Air Force Flight Test Center
AFSC	Air Force Systems Command
AFSC/AFGL	AFSC/Air Force Geophysics Laboratory
AFSC/SD	AFSC/Space Division
AFSCF	Air Force Satellite Control Facility
AFTFWC	Air Force Tactical Fighter Weapons Center
AWS	Air Weather Service
BMD	Ballistic Missile Division
DOD	Department of Defense
DOE	Department of Energy
DOE/NTS	DOE/Nevada Test Site
DPG	Dugway Proving Ground
ESMC	Eastern Space and Missile Center
ETR	Eastern Test Range
KMR	Kwajalein Missile Range
NASA	National Aeronautics and Space Administration
NASA/MSFC	NASA/Marshall Space Flight Center
NASA/WFC	NASA/Wallops Flight Center
NOAA	National Oceanic and Atmospheric Administration
NWC	Naval Weapons Center
PMTC	Pacific Missile Test Center
USA/DTC	U.S. Army/Deseret Test Center
USAECOM	U.S. Army Electronics Command
USAFETAC	United States Air Force Environmental Technical Applications Center

UTTR	Utah Test and Training Range
WSMC	Western Space and Missile Center
WSMR	White Sands Missile Range
WTR	Western Test Range
YPG	Yuma Proving Ground
6585TG	6585th Test Group
TSCF	Targeting Systems Characterization Facility

FOREWORD

Atmospheric parameters are essential to the research and development of missiles and aerospace vehicles. In the early 1960's, the need was recognized for realistic atmospheric models derived in a consistent manner for each of the several major test ranges. An atmospheric model derived from statistical data for a particular geographical location is referred to as a reference atmosphere.

The first Range Reference Atmosphere (RRA) was issued in 1963 by the Inter-Range Instrumentation Group (IRIG) for Cape Kennedy, Florida, and was followed by additional publications for several ranges up to 1974. Since that time, improved upper air data bases have become available from which to develop the RRA. These resulted from the extended period of records and from improvement in the upper air measuring program by rocketsondes for altitudes above the rawinsonde ceiling of 30 km. Revised and improved RRAs are justified for the following reasons:

1) Needs for more definitive statistical atmospheric models have arisen because of changes and advances in aerospace technology. The Space Transportation System (Space Shuttle) is one example.

2) Most ranges now have an extended and improved upper air data base from which to develop a more definitive RRA.

3) There are requirements for RRAs for new ranges and range sites.

4) There have been scientific advances in understanding the upper atmospheric structure and physical relationships.

5) Advances in statistical modeling techniques have been made because of the general availability of high-speed electronic computers. These have led to the adoption of advanced concepts in atmospheric modeling.

For these reasons, the Range Reference Atmosphere Committee (RRAC) was tasked by the Range Commanders Council Meteorology Group (RCC MG) to establish new and improved RRAs. The purpose, scope, and objectives of this task are outlined in the following paragraphs.

Purpose: This committee, Task MG-1, establishes RRAs for the several ranges as provided by the RCC. An RRA is a model of the Earth's atmosphere over a geographical location of interest, for use by DOD and other U.S. Government range users. The RRA is used to provide planning data for evaluating environmental constraints for the particular configurations of environment-sensitive systems and components being developed or undergoing tests.

Scope: Using the best available upper atmosphere data base to include rawinsonde, rocketsonde and possibly other high-altitude data sources for the range location, the task is to establish a model of certain statistics for wind and thermodynamic quantities derived in a uniform manner and published in a standardized format.

Objectives: The wind statistics shall be, insofar as practical, modeled to be consistent with rigorous mathematical probability properties of the multivariate normal probability theory. The thermodynamic quantities statistics shall be, insofar as practical, modeled to be consistent with the hydrostatic equation, the equation of state, and the probability principles that are related through these physical equations. The document shall serve as an authoritative source of information and as an atmospheric model for a particular range. The first in the series of revised RRAs to be published is for Kwajalein Missile Range (KMR) (publication date December 1982). The altitude range required for KMR is 0 to 70 km. The order of priority for the subsequent publications is:

	Range	Altitude Range Required
1.	AFFTC/Edwards AFB, CA	0 - 70 km[a]
2.	ESMC/Cape Canaveral AFS, FL	0 - 70 km
3.	WSMC/Vandenberg AFB, CA	0 - 70 km[a]
4.	WSMR/White Sands, NM	0 - 70 km
5.	PMTC/Point Mugu, CA	0 - 70 km
6.	UTTR/Dugway (Michael AAF), UT	0 - 30 km[b]
7.	AD/Eglin AFB, FL	0 - 30 km
8.	ESMC/Ascension Island	0 - 70 km (Terminates at 66 km because of insufficient data)
9.	NASA/Wallops Flight Center, VA	0 - 70 km
10.	Taquac (Guam)	0 - 30 km
11.	PMTC/Barking Sands, HI	0 - 70 km

In keeping with the RCC's objective of standardization, the modeling techniques, basic text, and tabulation format are to be the same for all RRAs. These new and revised RRAs present not only the mean values of the thermodynamic quantities (pressure, temperature, virtual temperature, and density), but also include statistical measures for the dispersion (i.e., standard deviations and skewness coefficients). New quantities presented are water vapor pressure and dewpoint temperature. The statistical modeling for the wind is entirely new. The new approach uses the properties of the bivariate normal probability distribution function.

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a. Use rocketsonde data from PMTC/Point Mugu for altitudes above 30 km.
b. Consider augmenting data base from Ely or Salt Lake City.

All final computations were performed by the United States Air Force Environmental Technical Applications Center (USAFETAC) in response to a task from Eastern Space and Missile Center (ESMC).

The text was prepared jointly by USAFETAC and the NASA/George C. Marshall Space Flight Center's Space Sciences Laboratory, Atmospheric Sciences Division. The editing and preparation of the draft manuscript were performed by the NASA/MSFC organization.

The cochairmen express their gratitude to all RRAC members and their respective colleagues who have made significant technical contributions to the establishment of these RRAs.

Special thanks are tendered to Lt. B. Novograd for his dilligence in forming the many computations and the development of the primary tables, I through IV. Special thanks goes to Lt. F. Wirsing for editing and formulating the equations for the derivable thermodynamic equations. These gentlemen performed this outstanding work under the direction of Major B. Lilius, USAFETAC.

Grateful acknowledgment goes to Mrs. Annette Tingle, NASA/MSFC, for editing the draft manuscript.

The RRAC consists of representatives from the U.S. Air Force, U.S. Army, National Aeronautics and Space Administration, U.S. Navy, and National Oceanic and Atmospheric Administration. The committee members for the RRA for the first publication are:

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CHAPTER I. INTRODUCTION

A. Definition and Purpose of the Range Reference Atmosphere

A.1 Definition

A reference atmosphere is a statistical model of the Earth's atmosphere derived from upper air measurements over a particular geographical location. Hence, these Range Reference Atmospheres (RRAs) are atmospheric models developed by the Range Reference Atmosphere Committee (RRAC) in response to a task by the Range Commanders Council Meteorology Group (RCC MG) and published by the RCC Secretariat. The RCC MG, formerly called the Inter-Range Instrumentation Group/Meteorology Working Group (IRIG/MWG), published a series of RRAs during the period 1963 through 1974.

A.2 Purpose

A series of revised and expanded RRAs are to be published for locations of interest to the RCC. These publications are to serve as authoritative reference sources on certain upper air statistics and as atmospheric models for particular range sites. The technical usefulness of these documents for the ranges, range users, U.S. aerospace industries, and the scientific community is recognized because of the standardization of the development techniques and the presentation of the tabulations.

B. Scope of the Range Reference Atmosphere and Arrangement of Tables

B.1 Scope

The RRA contains tabulations for monthly and annual means, standard deviations, and skewness coefficients for windspeed, pressure, temperature, density, water vapor pressure, virtual temperature, and dewpoint temperature; the means and standard deviations for the zonal (U) and meridional (V) wind components; and the linear (product moment) correlation coefficient between the wind components. These statistical parameters are tabulated at the station elevation, at 1-km intervals from sea level to 30 km, and at 2-km intervals from 30 to 90 km. The wind statistics are given at approximately 10 m above the station elevations and at altitudes with respect to mean sea level thereafter. For those range sites without rocketsonde measurements, the RRAs terminate at 30 km altitude, or they are extended, if required, when rocketsonde data from a nearby launch site are available. There are four sets of tables for each of the 12 monthly reference periods and the annual reference period.

B.2 Arrangement of Tables

The statistical parameters for the RRA models are presented in four tables, as outlined in the following paragraphs.

Table I contains all the wind statistical parameters. This table gives the monthly and annual means and standard deviations of the U and V wind components and the linear (product moment) correlation coefficient between these

two components; the mean, standard deviation and skewness coefficient of the windspeed; and the number of wind observations (sample size).

Table II contains the monthly and annual means, standard deviations, and skewness values of pressure, temperature, and density, and the number of observations used for each of these thermodynamic quantities.

Table III contains the monthly and annual means, standard deviations and skewness values of the water vapor pressure, virtual temperature and dewpoint, and the number of observations for each of these moisture-related quantities. The statistical parameters for water vapor pressure and dewpoint terminate at 15 km altitude. Above 15 km the statistical parameters for virtual temperature are considered to be the same as those for temperature.

Table IV contains the monthly and annual mean atmospheric models for the thermodynamic variables: pressure, virtual temperature, and density. This table is derived from the monthly and annual mean virtual temperature versus altitude (geometric) using the hydrostatic equation and the equation of state. Also presented is the geopotential height corresponding to the tabulated geometric altitudes.

The physical unit for all wind parameters is meters per second. The physical unit for pressure is millibars; for temperature and virtual temperature, degrees Kelvin; for density, grams per cubic meter; and for water vapor pressure, millibars. In all cases the skewness coefficient and the correlation coefficient between wind components are unitless. All reference to altitude is geometric altitude and is expressed in kilometers. All reference to height is geopotential height and has the unit geopotential meters or kilometers. All geometric altitudes and geopotential heights are with respect to mean sea level.

C. Data Quality Control Procedures

A small portion (less than 10 percent) of the soundings in the data base used to calculate the RRA tables contained erroneous data values. The soundings which contained these erroneous values were eliminated from the data base using the following procedures:

1) Soundings containing gaps in their height data greater than 200 mb were rejected. This step was taken because some soundings only contained height values at their "mandatory" pressure levels, which were occasionally missing, resulting in soundings with no height information at all.

2) An initial set of RRA statistics was computed using all the remaining soundings. This initial set of statistics was used to determine data limits for the temperature, pressure, U and V components of the wind, and the dewpoint (for the 0- to 30-km portion of the RRA) or the density (for the 30- to 90-km portion of the RRA). The lower (upper) data limits were set at the mean value for a specific parameter, minus (plus) six standard deviations of that quantity. One pair of data limits was computed for each of these parameters: month of the year and data level.

3) This initial set of data limits was then used to screen the data base. All the soundings that contained values outside these data limits were rejected. A new RRA was then computed using the screened data base. This second RRA was used to generate a second set of data limits.

4) The second set of data limits was then used to screen the data base further. A new RRA was again generated. The skewness values in this RRA were then evaluated, according to empirical criteria specified in section II.A.3 of this document for the winds, and according to criteria in section III.A.3 for the thermodynamic quantities. If these criteria were satisfied, the new RRA was then used to generate a final set of data limits, which were used to control the quality of the data base for the final version of the RRA.

5) Occasionally, the third RRA that was generated did not satisfy all of the skewness criteria. This indicated that some incorrect values were still present in the data base. To complete quality control, steps 3 and 4 were repeated for additional iterations (usually one or two) until the resulting RRA satisfied the skewness criteria. At that point, a final set of data limits was generated. This final set of data limits was then used to control the quality of the data base and generate the final RRA.

D. Organization of the Chapters

Because there are plans to publish a series of RRAs, comments on the special organization of the document are in order. The RRA document is arranged in four chapters. Chapter I is the introduction. Chapter II, Wind Statistics and Models, contains the techniques used to arrive at the wind statistical parameters, table I, and the probability functions that are to be used as wind models to derive several wind statistics. Chapter III, Statistics of Thermodynamic Quantities and Models, contains the techniques used to arrive at the thermodynamic and moisture-related statistical parameters given in tables II and III and the atmospheric thermodynamic model presented in table IV. This chapter also contains sets of equations to calculate several atmospheric properties. Chapter IV contains the general conclusions and recommendations. These four chapters are reprinted without change for each documented RRA to assure consistency and for expediency in preparing the documentation. To account for variations particular to a specific RRA, two appendixes have been included. Appendix A, Examples of Wind Statistics, is designed to give a few illustrative examples of wind statistics for the specific RRA and cursory observations, comparisons, or comments on wind statistics. Appendix B, Range Specific Information, is designed to present specific information particular to the range, such as geographical location, data base, etc., and any cursory observations or comments on the thermodynamic quantities.

Read these appendixes! They are located as the last two units in the document because they may vary in length depending on the circumstances. Appendixes A and B and tables I, II, III, and IV are the only differences among the RRA documents published in this new RRA series.

CHAPTER II. WIND STATISTICS AND MODELS

A. General Considerations

A.1. Objectives

An objective of the RRA is to furnish minimum tabulation for the wind statistics. To meet this objective, the bivariate normal probability distribution was adopted as a statistical model for the wind treated as a vector quantity at the RRA data levels. Only five statistical parameters are required to completely describe this probability function. In Cartesian coordinates these parameters are the means and standard deviations of the two orthogonal components and the correlation coefficient between the two components. These five statistical parameters for the U and V (meteorological coordinates) components are given in table I. The statistical properties of the bivariate normal probability distribution are used to derive many wind statistics that are of interest to the ranges and range users. This procedure produces consistent wind statistics that are connected through rigorous mathematical probability functions. By using these functions, extensive tabulations of wind statistics are avoided.

The statistical properties of the bivariate normal probability distribution presented for the vector wind statistical model are:

1) The wind components are univariate normally distributed.

2) The conditional distribution of one component given a value of the other component is univariate normally distributed.

3) The windspeed is of the form of a generalized Rayleigh distribution.

4) The frequency distribution of wind direction can be derived.

5) The conditional distribution of windspeed given a value of wind direction (wind rose) can be derived.

6) The five tabulated wind statistical parameters with respect to the meteorological U and V coordinate system can be derived for any arbitrary rotation of the orthogonal axes.

The probability distribution functions and sets of equations to derive wind statistics for the previously stated properties of the vector wind model are presented in this chapter. Symbols used are summarized in table A. Illustrative examples are presented in appendix A. No attempt is made to give the derivation of the probability functions. The reader is referred to Smith (1976) for some derivations and several applications of the probability distribution properties for wind statistics.

A.2. Data Quality Control

The U and V components of the wind were used to generate data limits set at plus and minus six standard deviations from the mean for each of the

TABLE A. LIST OF SYMBOLS USED IN CHAPTER II

N - The number of wind measurements in table I

r - A general variable for the bivariate normal probability distribution in polar coordinates

R - A generalized Rayleigh variable used for derived windspeed probability distribution

R (U, V) - The linear (product moment) correlation coefficient between the zonal and meridional wind components in table I

SK (W) - Skewness parameter for windspeed in table I

S (U) - The standard deviation of the zonal wind component in table I

S (V) - The standard deviation of the meridional wind component in table I

S (W) - The standard deviation of windspeed in table I

t - A standardized normal variate used in text table B

U - The zonal wind component

UBAR - The mean value of the zonal wind component in table I

V - The meridional wind component

VBAR - The mean value of the meridional wind component in table I

W - Windspeed or modulus of wind vector, a scalar quantity

WBAR - The mean value of windspeed in table I

X - A general component variable or coordinate axis

Y - A general component variable or coordinate axis

$\bar{X}$ - A general component mean value in the [x,y] coordinate system

$\bar{Y}$ - A general component mean value in the [x,y] coordinate system

α (alpha) - Rotation angle for the [x,y] coordinate system

TABLE A. (concluded)

θ (theta) - Wind direction in the polar coordinate system

$\lambda_{(\ )}$ (Lambda) - A parameter in the bivariate normal probability distribution in text table C

ξ (Xi) - The mean value in the standardized normal probability distribution used in text table B

π (Pi) - Constant = 3.14159 ...

ρ (Rho) - The general linear correlation coefficient between the two component variables in the [x,y] coordinate system

σ_x, σ_y - The general standard deviations of the x and y component variables in the [x,y] coordinate system.

quantities. These data limits were used to screen the wind data base, as described in section I.C. The data base was considered to be free from errors under the following conditions:

1) The skewness of the windspeed was below 4.0 at data levels where the mean windspeed was less than 15 m/s, and

2) The skewness of the windspeed was below 2.5 at data levels where the mean windspeed was greater than 15 m/s.

A.3 Limitations

For the wind statistics, the correlation coefficients for like wind components and unlike wind components between altitude levels were not computed. Therefore, wind statistics with respect to altitude (profile) cannot be derived from the RRA statistics. For wind profile modeling techniques the user is referred to Smith (1976). However, the wind statistics at discrete altitudes are valid; all of the probability distribution functions given in chapter II can be derived from the five wind component statistical parameters contained in table I, and the derived distributions can be considered as wind models at discrete altitudes.

By convention, in the statistical literature Greek letters are used for population or theoretically known parameters, and sample estimates are denoted by English alphabetical letters or with a "hat" ($\hat{}$) over the Greek letters. In chapter II Greek letters are used for the variances and the linear correlation coefficient, and the means are denoted by $\overline{X}$ and $\overline{Y}$ when dealing with the bivariate normal distribution. It will always be understood that table I contains sample estimates of the statistical parameters and they are with respect to the meteorological U and V coordinate system.

B. Coordinate System and Computation of Statistical Parameters

B.1. Coordinate System

Wind measurements are recorded in terms of magnitude and direction. The wind direction is measured in degrees clockwise from true north and is the direction from which the wind is blowing. The wind magnitude (the modulus of the vector) is the scalar quantity and is referred to as windspeed or scalar wind. A statistical description that accounts for the wind as a vector quantity is appropriate and requires a coordinate system.

For the RRA the standard meteorological coordinate system has been chosen for the wind statistics, all tables of statistical parameters, and related discussions because the coordinate system used in aerospace and related applied fields has not always been consistent.

Using figure 1, the polar and Cartesian forms for the meteorological coordinate system are defined:

W = windspeed, scalar wind, or magnitude of the wind vector in meters per second.

θ = wind direction. θ is measured in degrees clockwise from true north and is the direction from which the wind is blowing.

U = zonal wind component, positive west to east, in meters per second.

V = meridional wind component, positive south to north, in meters per second.

The components θ and W define the polar form, and the U-V components define the Cartesian forms:

$$U = -W \sin\theta \quad , \quad 0 \leq \theta \leq 360^\circ \tag{1}$$

$$V = -W \cos\theta \quad . \tag{2}$$

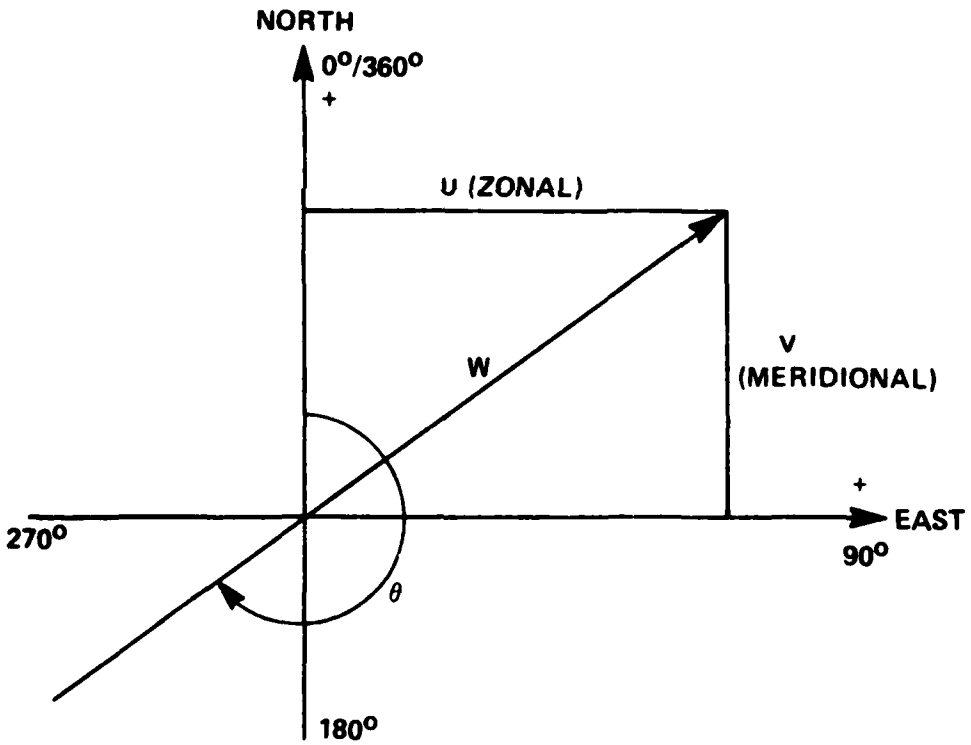

Figure 1. The meteorological coordinate system.

It is helpful to note the difference between the mathematical convention for a vector direction and the meteorological convention for wind direction:

$$\theta \text{ met} = 270 - \theta \text{ math} \tag{3}$$

when $0 \leq \theta$ math $\leq 270°$

$$\theta \text{ met} = 360 + (270 - \theta \text{ math})$$

when $270 \leq \theta$ math $\leq 360°$

B.2 Computation of Statistical Parameters

The wind statistical parameters in table I for the means and standard deviations of the U and V wind components and windspeed and the skewness parameter of windspeed were computed using the sums technique presented in chapter III.C.3. In addition, the linear (product moment) correlation coefficient between the U and V wind components, r (u,v) in table I, was computed. This correlation coefficient is defined as

$$r\,(u,v) = \frac{\sum_{i=1}^{n} (U_i - \bar{U})\,(V_i - \bar{V})}{N\ s(u) \cdot s(v)} \quad . \tag{4}$$

These statistical parameters are with respect to the Standard Meteorological Coordinate System.

C. Statistical Wind Models

C.1. Wind Component Statistics

The univariate normal (Gaussian) probability distribution function is used to obtain wind component statistics. In generalized notations, this probability density function (pdf) is

$$f\,(t) = \frac{e^{-\frac{t2}{2}}}{\sqrt{2\pi}} \quad , \tag{5}$$

where $t = X - \xi/\sigma_x$ is the standardized variate, with ξ defining the mean and σ_x the standard deviation. The probability distribution function (PDF) is

$$F(X) = \int_{-\infty}^{X} f(t)\ dt \quad . \tag{6}$$

Because this integral cannot be obtained in closed form, it is widely tabulated for zero mean and unit standard deviation. For a convenient reference for the RRA, selected values of F(X) are given in table B. To emphasize the connotation of probability, F(X) is shown in table B as $P\{X\}$.

The t values in table B are used as multiplier factors to the standard deviation to express the probability that a normally distributed variable, X, is less than or equal to a given value as

$$P\{X \leq \text{mean} + t\,\sigma_x\} = \text{probability, } p \quad . \tag{7}$$

For example, when t = 1.6449, the probability that X is less than or equal to the mean plus 1.6449 standard deviations is 0.95. That value of X that is less than or equal to the mean plus 1.6449 standard deviations is called the 95th percentile value of X. Also given in table B are the numerical values to express the probability that X falls in the interval X_1 and X_2; i.e.,

$$P\{X_1 \leq X \leq X_2\} = \text{Interpercentile Range} \ , \tag{8}$$

where

$$X_1 = \bar{X} - t\,\sigma_x$$

$$X_2 = \bar{X} + t\,\sigma_x \quad .$$

For t = 1.9602 the probability that X lies in the interval X_1 and X_2 is 0.95. The values of X_1 and X_2 in this example comprise the 95th interpercentile range.

For a normally distributed variable, the mode (most frequent value) and the median (50th percentile value) are the same as the mean value. The means and standard deviations of the U and V wind components from table 1 are used in equations (7) and (8) to compute the percentile values and interpercentile ranges of the U and V wind components. When equation (7) is illustrated on a normal probability graph, a straight line is formed.

C.2. The Vector Wind Model

Because wind is a vector quantity having direction and magnitude that can be expressed as two components in an orthogonal coordinate system, a probability model that describes the joint relationship is the bivariate normal probability distribution. In general component notation, the bivariate normal probability density function (BNpdf) is

TABLE B. VALUES OF t FOR STANDARDIZED NORMAL (UNIVARIATE) DISTRIBUTION FOR PERCENTILES AND INTERPERCENTILE RANGES

t	P(X)	X	$P\{X_1 < X < X_2\}$ (%)
-3.0000	0.00135	$\xi - 3.0000\ \sigma$	99.73 (0.27)
-2.5758	0.00500	$\xi - 2.5758\ \sigma$	99 (1.00)
-2.3263	0.01000	$\xi - 2.3263\ \sigma$	98 (2.00)
-2.2365	0.01266	$\xi - 2.2365\ \sigma$	97.468 (2.532)
-2.0000	0.02275	$\xi - 2.0000\ \sigma$	95.45 (4.55)
-1.9602	0.02500	$\xi - 1.9602\ \sigma$	95 (5)
-1.6449	0.05000	$\xi - 1.6449\ \sigma$	90 (10)
-1.2816	0.10000	$\xi - 1.2816\ \sigma$	80 (20)
-1.0000	0.15866	$\xi - 1.0000\ \sigma$	68.268 (31.732)
-0.8416	0.20000	$\xi - 0.8416\ \sigma$	60 (40)
-0.6745	0.25000	$\xi - 0.6745\ \sigma$	50 (50)
-0.2533	0.40000	$\xi - 0.2533\ \sigma$	20 (80)
0.0000	0.50000	ξ	
0.2533	0.60000	$\xi + 0.2533\ \sigma$	
0.6745	0.75000	$\xi + 0.6745\ \sigma$	
0.8416	0.80000	$\xi + 0.8614\ \sigma$	
1.0000	0.84134	$\xi + 1.0000\ \sigma$	
1.2816	0.90000	$\xi + 1.2816\ \sigma$	
1.6449	0.95000	$\xi + 1.6449\ \sigma$	
1.9602	0.97502	$\xi + 1.9602\ \sigma$	
2.0000	0.97725	$\xi + 2.0000\ \sigma$	
2.2365	0.98734	$\xi + 2.2365\ \sigma$	
2.3263	0.99000	$\xi + 2.3263\ \sigma$	
2.5758	0.99500	$\xi + 2.5758\ \sigma$	
3.0000	0.99865	$\xi + 3.0000\ \sigma$	

where $X_1 = \xi - t\sigma$
and $X_2 = \xi + t\sigma$

$$f(X,Y) = \frac{1}{2\pi\sigma_x\sigma_y\sqrt{1-\rho^2}}\left[\exp\ \frac{-1}{2(1-\rho^2)}\left\{\frac{(X-\bar{X})^2}{\sigma_x^2}\right.\right.$$

$$\left.\left. - \frac{2\rho(X-\bar{X})(Y-\bar{Y})}{\sigma_x\sigma_y} + \frac{(Y-\bar{Y})^2}{\sigma_y^2}\right\}\right] \quad -\infty \leq X \leq \infty \text{ and}$$

$$-\infty \leq Y \leq \infty \quad , \tag{9}$$

where the five parameters are $\bar{x},\bar{y}$, the component means; σ_x, σ_y, the component standard deviations; and ρ, the correlation coefficient between the two component variables, X and Y.

For many applications the interest is in determining the probability that a point $\{X,Y\}$ will fall within a contour of equal probability density. The exponential terms of equation (9), when set equal to a constant, λ^2, give a family of ellipses depending on the value of the constant. The ellipses have a common center at the point $\{\bar{X},\bar{Y}\}$. Integration of equation (9) over the region bounded by the contours of equal probability density gives

$$P(\lambda) = 1 - e^{\frac{-\lambda^2}{2(1-\rho^2)}} \quad . \tag{10}$$

Solving for λ^2 and replacing $P(\lambda)$ by p gives

$$\lambda^2 = -2(1-\rho^2)\ln(1-p) \quad . \tag{11}$$

Now define

$$\lambda_e = \sqrt{2}\sqrt{-\ln(1-p)} \quad . \tag{12}$$

For ready reference and comparisons, λ_e is shown in table C for selected values of p.

TABLE C. VALUES OF λ FOR BIVARIATE NORMAL DISTRIBUTION ELLIPSES AND CIRCLES

P(%)	λ_c (ellipse)	λ_c (circle)	P(%)	λ_c (ellispe)	λ_c (circle)
0.000	0.0000	0.0000	65.000	1.4490	1.0246
5.000	0.3203	0.2265	68.268	1.5151	1.0713
10.000	0.4590	0.3246	70.000	1.5518	1.0973
15.000	0.5701	0.4031	75.000	1.6651	1.1774
20.000	0.6680	0.4723	80.000	1.7941	1.2686
25.000	0.7585	0.5363	85.000	1.9479	1.3774
30.000	0.8446	0.5972	86.466	2.0000	1.4142
35.000	0.9282	0.6563	90.000	2.1460	1.5175
39.347	1.0000	0.7071	95.000	2.4477	1.7308
40.000	1.0108	0.7147	95.450	2.4860	1.7579
45.000	1.0935	0.7732	98.000	2.7971	1.9778
50.000	1.1774	0.8325	98.168	2.8284	2.0000
54.406	1.2533	0.8862	98.889	3.0000	2.1213
55.000	1.2637	0.8936	99.000	3.0348	2.1460
60.000	1.3537	0.9572	99.730	3.4393	2.4320
63.212	1.4142	1.0000	99.9877	4.2426	3.0000

$$\lambda_c = \sqrt{2}\sqrt{-\ln(1-P)}$$

$$\lambda_c = \sqrt{-\ln(1-P)}$$

The probability ellipse that contains p-percent of the wind vectors expressed in the most general form is the conic defined by

$$AX^2 + BXY + CY^2 + DX + EY + F = 0 \quad , \tag{13}$$

where

$$A = \sigma_y^2$$

$$B = -2\rho\sigma_x\sigma_y$$

$$C = \sigma_x^2$$

$$D = 2\sigma_x\sigma_y\ \rho\bar{Y} - 2\sigma_y^2\bar{X} = -\ (B\bar{Y} + 2A\bar{X})$$

$$E = 2\sigma_x\sigma_y\ \rho\bar{X} - 2\sigma_x^2\bar{Y} = -\ (B\bar{X} + 2C\bar{Y})$$

$$F = A\bar{X}^2 + C\bar{Y}^2 + B\bar{X}\bar{Y} - AC\ (1 - \rho^2)\ \lambda_e^2 \quad ,$$

and

$$\lambda_e = \sqrt{2}\ \sqrt{-\ln\ (1 - \rho)} \quad .$$

For graphical presentations, the range of the variable is important in order to arrange the scale. The largest and smallest values of X and Y for a given probability ellipse, p, are given by

$$X_{L,S} = \bar{X} \pm \sigma_x\lambda_e \tag{14}$$

$$Y_{L,S} = \bar{Y} \pm \sigma_y\lambda_e \quad , \tag{15}$$

where, as before, $\lambda_e = \sqrt{2}\ \sqrt{-\ln\ (1 - p)}$.

Although there are several approaches to graphing the probability ellipses, the following procedure is advantageous for electronic computer plotting. In establishing the computer plotting program, the sample estimates for $\overline{X},\overline{Y}$, σ_x, σ_y, and ρ are constants in equation (13). The user makes the choice of probability ellipses desired. Thus, p in equation (12) is programmed as a parameter. The largest and smallest values for X and Y are computed by equations (14) and (15) for the largest probability ellipse selected. This sets the graphical scale. Values of X within the range of "X smallest" to "X largest" are obtained by incrementing X between these limits. Using the quadratic equation, a solution for Y of equation (13) is made and plotted for each value of X. The centroid $(\overline{X},\overline{Y})$ for the family of probability ellipses is plotted as a point. Labeling and other identification complete the plotting program.

For a given probability, equation (13) defines an ellipse that contains p-percent of the points X,Y. Since the entire area under the bivariate normal density function [equation (9)] is unity, upon integration for a given probability ellipse, that given ellipse contains p-percent of the total area. In the wind statistics, p-percent of the wind vectors fall within the specified probability ellipse. From this point of view, a specified probability ellipse gives the joint probability that p-percent of the U-V components lie within the given ellipse.

When $\sigma_x^2 = \sigma_y^2 = \sigma^2$ and $\rho = 0$ in the bivariate normal distribution, the probability ellipses of equation (13) reduce to circles whose centers are at the means $\overline{X},\overline{Y}$. The radii of the probability circles are $\sigma_{V1}\lambda_c$, where

$$\sigma_{V1} = \sqrt{2\sigma^2} \tag{16}$$

and

$$\lambda_c = \sqrt{-\ln\ (1 - p)} \quad . \tag{17}$$

Values for λ_c for selected probabilities, p, are given in table C.

Because this function is simple, it can easily be graphed manually. However, the generalized plotting technique for electronic computer plotters, as represented by equation (13), can be advantageously used.

C.3. Derived Distributions for Wind Statistics

In this subsection the probability distribution functions and sets of equations are presented to derive certain probability distribution functions for wind statistics. These derived probability distributions are:

1) The conditional distribution of wind components

2) The generalized Rayleigh distribution for windspeed

3) The distribution for wind direction

4) The conditional distribution of windspeed given a wind direction (wind rose).

The required five statistical parameters for these derived distributions for wind statistics are given in table I.

C.3.1 The Conditional Distribution of Wind Components

Given that two random variables X and Y are bivariate normally distributed, the conditional distribution $f(Y|X)$ is read as $f(Y)$ given X, and likewise $f(X|Y)$ is read as $f(X)$ given Y. The conditional probability distribution function $F(Y|X)$ has the mean $E(Y|X)$ and variance $\sigma^2_{(x|y)}$, where

$$E(Y|X^*) = \bar{Y} + \rho\left(\frac{\sigma_y}{\sigma_x}\right)(X^* - \bar{X}) \tag{18}$$

and

$$\sigma^2_{(y|x^*)} = \sigma_y{}^2 (1 - \rho^2) \quad . \tag{19}$$

The conditional standard deviation is

$$\sigma_{(y|x^*)} = \sigma_y \sqrt{1 - \rho^2} \quad . \tag{20}$$

By interchanging the variables and parameters, the conditional distribution function for $F(X|Y^*)$ has the conditional mean

$$E(X|Y^*) = \bar{X} + \rho\left(\frac{\sigma_x}{\sigma_y}\right)(Y^* - \bar{Y}) \quad , \tag{21}$$

conditional variance

$$\sigma^2_{(x|y^*)} = \sigma_x^2 (1 - \rho^2) \quad , \tag{22}$$

and conditional standard deviation

$$\sigma_{(x|y^*)} = \sigma_x \sqrt{1 - \rho^2} \quad . \tag{23}$$

The preceding conditional probability distribution functions are univariate normal distributions for a (fixed) given value for one of the bivariate normal variables. Thus, the t-values given in table B are applicable for conditional probability statements. For example,

$$F(Y|X^*) = E(Y|X^*) + t\sigma_{(y|x^*)} \quad . \tag{24}$$

For $t = 1.6449$ there is a 95 percent chance that Y is less than or equal to $\bar{Y} + 1.6449\ \sigma_{(y|x^*)}$ given that $X = X^*$. In symbols this statement reads

$$P\left\{ Y \leq E(Y|X^*) + 1.6449\ \sigma_{(y|x^*)} \ |X = X^* \right\} = 0.9500 \quad . \tag{25}$$

Interval probability statements can also be made; namely,

$$P\left\{ Y_1 = E(Y|X^*) - t\sigma_{(y|x^*)} \leq Y \leq Y_2 = E(Y|X^*) + t\sigma_y \ |X = X^* \right\}$$

where X^* can take on any fixed value of X, but a convenient arrangement is to let $X^* = \bar{X} \pm t\sigma_x$.

The close connection of the regression function of Y on X to the conditional mean for the bivariate normal distribution is noted; namely,

$$Y = \bar{Y} + \rho\left(\frac{\sigma_y}{\sigma_x}\right)(X - \bar{X}) \quad . \tag{26}$$

Similarly, the regression function of X on Y is

$$X = \bar{X} + \rho\left(\frac{\sigma_y}{\sigma_x}\right)(Y - \bar{Y}) \quad . \tag{27}$$

These are linear functions and express the same results as would be obtained from a least-squares regression line.

C.3.2. The Generalized Rayleigh Distribution for Windspeed

If two random variables, X and Y, are bivariate normally distributed, then the probability distribution for the modulus, R, can be derived in terms of the five parameters that define the bivariate normal distribution.

$$R = \sqrt{X^2 + Y^2} \tag{28}$$

The distribution of R so derived is called a generalized Rayleigh distribution because there are no restrictions on the parameters. For applications to the RRA, the variable R is recognized as windspeed or the modulus of the wind vector.

The probability density function for R is expressed as

$$f(R) = a_0 R e^{-a_1 R^2}\left[I_0(a_2 R^2)\, I_0(a_3 R) + 2\sum_{k=1}^{\infty} I_k(a_2 R^2)\, I_{2k}(a_3 R)\cos 2k\psi \right] \quad R \geq 0 \quad . \tag{29}$$

The functions $I_0(\cdot)$, $I_k(\cdot)$, and $I_{2k}(\cdot)$ are the modified Bessel functions of the first kind for zero order, kth order, and 2kth order. The coefficients ar

$$a_0 = \exp\left[-\frac{1}{2}\left\{\frac{\bar{X}^2}{\sigma_a^2} + \frac{\bar{Y}^2}{\sigma_b^2}\right\}\right] \Big/ \sigma_a \sigma_b \quad ,$$

where σ_a^2 and σ_b^2 are the rotated variances to produce zero correlation between X and Y. σ_a and σ_b are the positive and negative roots[1] of the expression

$$\sigma^2_{(+,-)} = \frac{1}{2}\left\{\sigma_x^2 + \sigma_y^2 \pm \left[(\sigma_x^2 + \sigma_y^2)^2 - 4\sigma_x^2\sigma_y^2(1 - \rho^2)\right]^{1/2}\right\} \quad ,$$

$$a_1 = (\sigma_x^2 + \sigma_y^2)/4(1 - \rho^2)\,\sigma_x^2\sigma_y^2 \quad ,$$

$$a_2 = \frac{\left[(\sigma_x^2 - \sigma_y^2)^2 + 4\rho^2\sigma_x^2\sigma_y^2\right]^{1/2}}{4(1 - \rho^2)\,\sigma_x^2\sigma_y^2} \quad ,$$

$$a_3 = \left[\left(\frac{\bar{X}}{\sigma_a^2}\right)^2 + \left(\frac{\bar{Y}}{\sigma_b^2}\right)^2\right]^{1/2} \quad ,$$

---

1. *This computational form is obtained from the determinant*

$$\begin{vmatrix} \sigma_x^2 - K & \sigma_x\sigma_y\rho \\ \sigma_x\sigma_y\rho & \sigma_y^2 - K \end{vmatrix} \quad ,$$

where K is $\sigma^2_{(+,-)}$, *and* σ_a *and* σ_b *are analogous to the standard deviation of the major and minor axes of the bivariate normal probability ellipse.*

and

$$\tan \psi = \frac{\bar{Y}}{\bar{X}} \frac{\sigma_a^2}{\sigma_b^2} \quad .$$

Since this density function cannot be integrated in closed form from zero to R, numerical integration is used to obtain practical results for the probability distribution function; i.e.,

$$F(R) = \int_0^{R^*} f(R)\, dR \quad . \tag{30}$$

A number of special cases can be obtained from the general Rayleigh distribution [equation (29)], the simplest of which is to let $\sigma_x \equiv \sigma_y = \sigma$ and $\bar{X} = \bar{Y} = 0$ with independent variables X and Y. This gives

$$f(R) = \frac{R}{\sigma^2} e^{-R^2/2\sigma^2} \quad , \tag{31}$$

which is recognized as the classical Rayleigh probability density function. The density function, equation (31), can be integrated in closed form over any range of the variable R. Hence, the probability distribution function, F(R), for equation (31) is

$$F(R) = 1 - \exp\left\{\frac{-R^2}{2\sigma^2}\right\} \quad . \tag{32}$$

C.3.3. The Derived Distribution of Wind Direction

Considering the wind as a vector quantity and bivariate normally distributed, the wind direction can be derived. This is done by first writing the bivariate normal probability density function in polar coordinates whose variables are

$$g(r,\vartheta) = rd_1 e^{-\frac{1}{2}(a^2r^2 - 2br + c^2)} \quad , \qquad (33)$$

(see footnote 2)

where

$$a^2 = \frac{1}{(1-\rho^2)}\left[\frac{\sin^2\theta}{\sigma_x^2} - \frac{2\rho\cos\theta\sin\theta}{\sigma_x\sigma_y} + \frac{\cos^2\theta}{\sigma_y^2}\right] \quad ,$$

$$b = \frac{-1}{(1-\rho^2)}\left[\frac{\bar{x}\sin\theta}{\sigma_x^2} - \frac{\rho(\bar{x}\cos\theta + \bar{y}\sin\theta)}{\sigma_x\sigma_y} + \frac{\bar{y}\cos\theta}{\sigma_y^2}\right] \quad ,$$

$$c^2 = \frac{1}{(1-\rho^2)}\left[\frac{\bar{x}^2}{\sigma_x^2} - \frac{2\rho\bar{x}\bar{y}}{\sigma_x\sigma_y} + \frac{\bar{y}^2}{\sigma_y^2}\right] \quad ,$$

$$d_1 = \frac{1}{2\pi\sigma_x\sigma_y\sqrt{1-\rho^2}} \quad ,$$

$r = \sqrt{x^2 + y^2}$ is the modulus of the vector or speed, and θ is the direction of the vector. After integrating $g(r,\theta)$ over $r = 0$ to ∞, the probability density function of θ is

$$g(\vartheta) = \frac{d_1}{a^2} e^{-\frac{1}{2}c^2}\left[1 + \sqrt{2\pi}\left(\frac{b}{a}\right)e^{\frac{1}{2}\left(\frac{b}{a}\right)^2} : \left(\frac{b}{a}\right)\right] \quad , \qquad (34)$$

2. *This expression, equation (33), in Smith 1976) is given with respect to the mathematical convention for a vector direction.*

where a2, b, c2, and d_1 are as previously defined in equation (33) and

$$\Phi\left(\frac{b}{a}\right) = \Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{1}{2}t^2}\, dt$$

is taken from tables of normal distribution functions or made available through a computer subroutine.

If desired, equation (34) can be integrated numerically over a chosen range of θ to obtain the probability that the vector direction will lie within the chosen range; i.e.,

$$F(\theta) = \int_{\theta_2}^{\theta_1} g(\theta)\, d\theta \quad . \tag{35}$$

One application may be to obtain the probability that the wind will flow from a given quadrant or sector as, for example, onshore.

C.3.4. The Derived Conditional Distribution of Windspeed Given the Wind Direction (Wind Rose)

Continuing with the considerations in section C.3.3. of this chapter, the conditional probability density function (pdf) for windspeed, r, given a specified value for the wind direction, θ, can be expressed as

$$f(r|\theta) = \frac{a^2 r\, e^{-\frac{1}{2}(a^2 r^2 - br)}}{1 + \sqrt{2\pi}\left(\frac{b}{a}\right) e^{\frac{1}{2}\left(\frac{b}{a}\right)^2} \Phi\left\{\frac{b}{a}\right\}} \quad , \tag{36}$$

where the coefficients, $\underline{a}$ and $\underline{b}$ and the function $\Phi\left\{\frac{b}{a}\right\}$ are as previously defined in equation (33) and in equation (34).

From equation (36) the mode (most frequent value) of the conditional windspeed given a specified value of the wind direction is the positive solution of the quadratic equation,

$$a^2 r^2 - br - 1 = 0 \quad , \tag{37}$$

which is

$$(\hat{r}\,|\,\theta) = \frac{1}{2a}\left[\left(\frac{b}{a}\right) + \sqrt{4 + \left(\frac{b}{a}\right)^2}\right] \quad . \tag{38}$$

The locus of the conditional modal values of windspeed when plotted in polar form versus the given wind directions forms an ellipse.

The noncentral moment for equation (36) is expressed as

$$\mu'_n = \int_0^\infty r^n \, f(r\,|\,\theta)\, dr \quad . \tag{39}$$

Now the first noncentral moment is identical to the first central moment or the expected value, E $(r|\theta)$. The integration of equation (39) for the first moment is sufficiently simple to yield practical computations and can be expressed as

$$E(r\,|\,\theta) = \frac{\left(\frac{b}{a}\right) + \left[1 + \left(\frac{b}{a}\right)^2\right] \sqrt{2\pi}\; e^{\frac{1}{2}\left(\frac{b}{a}\right)^2} \Phi\left\{\frac{b}{a}\right\}}{a\left[1 + \left(\frac{b}{a}\right) \sqrt{2\pi}\, e^{\frac{1}{2}\left(\frac{b}{a}\right)^2} \Phi\left\{\frac{b}{a}\right\}\right]} \quad . \tag{40}$$

Hence, equation (40) gives the conditional mean value of the windspeed given a specified value for the wind direction.

The integration of equation (36) for the limits r = 0 to r = r* gives the probability that the conditional windspeed is $\leq$ r* given a value for the wind direction, θ. This conditional probability distribution (PDF) can be written as

$$\Pr\left\{r \leq r^* \mid \theta = \theta_o\right\} = 1 - \left[\frac{e^{-\frac{1}{2} r_s^2} + \sqrt{2\pi}\left(\frac{b}{a}\right)\left\{1 - \Phi\,(r_s)\right\}}{e^{-\frac{1}{2}\left(\frac{b}{a}\right)^2} + \sqrt{2\pi}\left(\frac{b}{a}\right) \Phi\left\{\frac{b}{a}\right\}}\right], \tag{41}$$

where $r_s = \left[a\, r^* - \left(\frac{b}{a}\right)\right]$.

By definition, equation (41) is an expression for a "wind rose." Empirical wind rose statistics are often tabulated or graphically illustrated giving the frequency that the windspeed is not exceeded for those windspeed values that lie within assigned class intervals of the wind direction. After evaluation of equation (41) for various values of windspeed, r*, and the given wind directions, θ, interpolations can be performed to obtain various percentile values of the conditional windspeed.

For the special case when $\underline{b}$ in equation (33) equals zero (i.e., for $\bar{x} \equiv \bar{y} = 0$), the conditional modal values of windspeeds [equation (38)], the conditional mean values of windspeeds [equation (40)], and the fixed conditional percentile values of windspeeds [interpolated from evaluations of equation (41)], when plotted in polar form versus the given wind directions, produce a family of ellipses.

For the special case when $\bar{x} = \bar{y} = 0$, equation (36) reduces to the following simple case:

$$\Pr\left\{ r \leq r^* \mid \theta = \theta_0 \right\} = 1 - e^{-\frac{a^2 r^{*2}}{2}} \quad . \tag{42}$$

There is a special significance of equation (42) when related to the bivariate normal probability distribution. If r* and θ are measured from the centroid of the probability ellipse, then the probability that $r \leq r^*$ is the same as the given probability ellipse. Further, solving equation (42) for r*, gives

$$r^* = \frac{1}{a} \sqrt{-2 \ln (1 - P)} \quad . \tag{43}$$

If a probability ellipse P is chosen, equation (42) gives the distance of r along any θ from the centroid of the ellipse to the intercept of the specified probability ellipse. If there is an interest in conditional probability of winds for a given θ relative to the monthly means, equation (43) is applicable. If it is desired to find the magnitude of the wind along any θ relative to the monthly mean to the intercept of a given probability ellipse, equation (43) is applicable.

D. Statistical Parameters With Respect To Any Orthogonal Axes

The five wind statistical parameters presented in table I are given with respect to the standard meteorological coordinate system; i.e., these parameters are for the U and V components. For many aerospace vehicles and range applications, there is a need for wind statistics with respect to orthogonal axes other than west to east and south to north. For example, it may be required to present wind statistics with respect to a flight azimuth of an

aerospace vehicle whose flight azimuth is α degrees from true north measured in a clockwise direction. The following sets of equations are presented to compute the five parameters for the new coordinate axes rotated α degrees clockwise from true north.

a. Rotation of the means through α degrees:

$$\bar{X}_\alpha = \bar{X} \cos (90 - \alpha) + \bar{Y} \sin (90 - \alpha) \tag{44}$$

$$\bar{Y}_\alpha = \bar{Y} \cos (90 - \alpha) - \bar{X} \sin (90 - \alpha) \quad . \tag{45}$$

b. Rotation of the variances through α degrees:

$$\sigma_{x_\alpha}^2 = \sigma_x^2 \cos^2 (90 - \alpha) + \sigma_y^2 \sin^2 (90 - \alpha)$$

$$+ 2\rho\sigma_x\sigma_y \cos (90 - \alpha) \sin (90 - \alpha) \tag{46}$$

$$\sigma_{y_\alpha}^2 = \sigma_y^2 \cos^2 (90 - \alpha) + \sigma_x^2 \sin^2 (90 - \alpha)$$

$$- 2\rho\sigma_x\sigma_y \cos (90 - \alpha) \sin (90 - \alpha) \quad . \tag{47}$$

c. Rotation of the linear correlation coefficient through α degrees:

$$\rho_\alpha = \frac{\text{cov } (X,Y)_\alpha}{\sigma_{x_\alpha}\sigma_{y_\alpha}} \quad , \tag{48}$$

where $\text{cov } (X,Y)_\alpha$ is the rotated covariance,

$$\text{cov } (X,Y)_\alpha = \text{cov } (X,Y) [\cos^2 (90 - \alpha) - \sin^2 (90 - \alpha)]$$

$$+ \cos (90 - \alpha) \sin (90 - \alpha) (\sigma_y^2 - \sigma_x^2)$$

and

$$\text{cov}\ (X,Y) = \rho\sigma_x\sigma_y \quad .$$

By using these rotational equations, the bivariate normal distribution with respect to any desired rotated coordinates can be obtained from sample estimates that have been computed with respect to a specific axis. The marginal distributions after rotation are also normally (univariate) distributed. Using the rotational equations greatly reduces computational efforts for applications requiring statistics with respect to several coordinate axes.

Appendix A presents some illustrative examples for the wind statistics of the specific RRA.

CHAPTER III. STATISTICS OF THERMODYNAMICS QUANTITIES AND MODELS

A. General Considerations

A.1. Objectives

The objective inherent in developing the thermodynamic section of the RRA was to describe the thermodynamic characteristics of the atmosphere using a minimum of data tabulations. A set of parameters was selected which, together, thermodynamically describe the climatological state of the atmosphere. These parameters are the pressure, temperature, density, dewpoint, virtual temperature, and water vapor pressure. Used together, these parameters permit the calculation of a large number of derived quantities. (Symbols used in the calculations in this chapter are summarized in table D.) Some of these quantities, such as the speed of sound, are dealt with in section III.E.

The probability distribution of each of the six thermodynamic RRA parameters is described by its mean value, its standard deviation, and its skewness. Several of these parameters (temperature, pressure, dewpoint and density) have probability distributions that are close to a univariate normal distribution; the others do not. The skewness parameter gives an estimate of the asymmetrical departures of a probability distribution.

Hydrostatically modeled mean values of pressure and density were calculated (table IV), so that users may determine the departure of the actual climatological values of these parameters from hydrostatic conditions. This was done by hydrostatically integrating the pressure from the lowest RRA data level to the termination altitude of the particular RRA.

A.2. Data Quality Control

Data limits derived from the following parameters were used to screen the thermodynamic portion of the RRA data base: temperature, pressure, dewpoint (for the 0- to 30-km portion only), and density (for the 30- to 70-km portion only). These limits were set to plus and minus six standard deviations from the mean values of each of these quantities. These limits were used to screen the thermodynamic portion of the RRA data base, according to the procedures described in section I.C. The data base used to generate the thermodynamic portion of the RRA (tables I, II, and IV) was considered to be free from errors under the following conditions:

a) The skewness values of the pressure and temperature were between -2.5 and 2.5 at all data levels.

b) The skewness values of the density were between -3.5 and 3.5 at data levels between 0 and 30 km.

c) The skewness values of the density were between -3.0 and 3.0 at data levels between 30 and 70 km.

d) The skewness values of the dewpoint were between -2.5 and 2.5 at all data levels with more than 10 data values.

TABLE D. LIST OF SYMBOLS USED IN CHAPTER III

C_s - Speed of sound

C_d - Collision diameter

E - Vapor pressure

g_ϕ - Gravity at latitude ϕ

H - Geopotential height

H_m - Geopotential height at a mandatory radiosonde data level

H_s - Geopotential height at a significant radiosonde data level

K_t - Coefficient of thermal conductivity

L - Mean free path length

M - Mean molecular weight of air at sea level

M3Q - Annual or monthly third moment of quantity Q

n - Refractive modulus

N - Refractive index

NA - Avogadro's constant

N_Q - Number of values of quantity Q

P - Pressure

P_m - Pressure at a mandatory radiosonde data level

P_s - Pressure at a significant radiosonde data level

P_h - Hydrostatically integrated mean monthly or annual pressure

Q - Any tabulated RRA quantity

R* - Universal gas constant

R' - Specific gas constant of dry air

r', r* - Parameters used in converting z to h and vice versa

TABLE D. (concluded)

S - Sutherland's constant, used in the calculation of dynamic viscosity

T - Temperature

T_d - Dew point

T_v - Virtual temperature

T_{vm} - Virtual temperature at a mandatory radiosonde data level

T_{vs} - Virtual temperature at a significant radiosonde data level

V - Mean air particle speed

V_c - Mean collision frequency

w - Parameter used in the hydrostatic interpolation of pressure and density

Z - Geometric altitude

- Wavelength

$_Q$ - Skewness of quantity Q

- Constant used in the equation for viscosity

- Ratio of specific heat at constant pressure to specific heat at constant volume

- Kinematic coefficient of viscosity

- Dynamic coefficient of viscosity

- Density

h - Mean monthly or annual density derived from pressure height

- Standard deviation of the quantity Q

A.3. Limitation of Thermodynamic Statistics

The correlation coefficients between the thermodynamic quantities and the moisture-related quantities were not calculated at discrete altitudes, nor were any of the correlations between altitudes. Therefore, valid statistical dispersion models that require the relationship between two or more of these quantities at the same altitude or between altitudes cannot be derived. Approximations for the correlation coefficients between pressure, virtual temperature, and density at discrete altitudes may be obtained from the coefficients of variation as developed by Buell (1970). The coefficient of variation is the standard deviation divided by the mean. The mean values and the standard deviations are taken from table II. A model for the profile of monthly and annual mean pressure, virtual temperature, and density that is in excellent agreement with the respective statistical mean values is given by table IV. This agreement results because the physical relationships, given by the hydrostatic equation and the equation of state, were used to derive table IV. When only the monthly or annual mean values for pressure, virtual temperature, and density are required, it is recommended that table IV be used.

B. Establishing Data Samples at the Required Altitude Levels

This section describes the computational procedures used to establish data samples of the thermodynamic RRA parameters at the RRA data levels. References are cited only when an equation given is one of many available in the literature or when an equation is stated in an unusual form.

B.1. Conversion of Data Recorded in Geopotential Heights to Geometric Altitude

The upper air rocketsonde observations used to obtain the table values above 30 km were recorded in terms of geometric altitude and can be interpolated directly to the altitude intervals shown in the tables. However, the radiosonde observations used to obtain the tabular values below 30 km were recorded in terms of geopotential heights. The change of coordinates from geopotential heights to geometric altitudes (h to z) is accomplished by calculating a table of geopotential heights that correspond exactly to the geometric altitudes at which the atmospheric parameters are tabulated. The radiosonde observations are then interpolated to these geopotential heights. The relationship used to calculate geometric altitude from geopotential height is

$$H = (r'z)/(r^*z) \quad , \tag{49}$$

where

$$r' = gr^*/9.80665$$

and

$$r^* = -2g_\phi/(\partial g_\phi/\partial z_o) \quad .$$

g_ϕ is the sea-level gravity at the latitude ϕ corresponding to the proper location. This value is given by (List, 1968)

$$g_\phi = 9.780356\ (1 + 5.2885 \times 10^{-3} \sin^2\phi - 5.9 \cdot 10^{-6} \sin^2 (2\phi)). \qquad (50)$$

$\frac{\partial g_\phi}{\partial z_o}$ is the rate of change of gravity at the sea level. This quantity is given by the equation

$$\frac{\partial g_\phi}{\partial z_o} = -3.085462 \times 10^{-6} + 2.27 \times 10^{-9} \cos (2\phi) - 2 \times 10^{-12} \cos (4\phi). \qquad (51)$$

The units used for gravity are meters per square second, while the units for $\frac{\partial g_\phi}{\partial z_o}$ are per square second.

The resulting table of values of H obtained by using even increments of 2 in equation (49) is shown in table IV of the RRA. The values of H above 30 km are not used in the interpolation of original data, but are included for the convenience of the user.

B.2. Calculations on the Original Rawinsonde Data Records

It was necessary to interpolate the information from the original rawinsonde data records to the geometric altitudes specified as the RRA data levels. The parameters for which this interpolation was required were the temperature, dewpoint, and pressure. The other parameters were calculated from the interpolated values at each RRA data level. These "derived" parameters were the water vapor pressure, density, and virtual temperature.

B.2.1. Calculation of the Geopotential Height at Significant Levels

Two somewhat different interpolation procedures were used to obtain data from radiosonde and rocketsonde observations at the levels shown in the tables. The procedure used to interpolate radiosonde observations began with the calculation of virtual temperature at each data level in a sounding. The virtual temperature was computed by

$$T_v = T/(1. - 0.379\ (e/p)) \quad , \qquad (52)$$

where T_v and T are in degrees Kelvin and e and p are in millibars.

The radiosonde soundings contain a mix of data taken at "mandatory" and "significant" levels. Pressure, temperature, and dewpoint information was given in these soundings at both types of levels. However, geopotential height information was only given at the mandatory levels. The heights at the significant levels were "filled in" (calculated) hydrostatically using pressure and temperature data from these levels. This procedure permitted the use of most of the significant level data in the calculation of the RRA tables. The equation used for this process was

$$H_s = H_m + 29.2712617 \quad \frac{(T_{vs} - T_{vm})}{2} \quad \ln(P_s/P_m) \quad , \tag{53}$$

where the subscripts s and m denote quantities at significant and mandatory levels. This equation was not used if the difference between two adjacent mandatory levels was greater than 200 mb. All soundings with such data gaps were rejected for use in compiling the RRA.

B.2.2. Temperature

Radiosonde temperatures were interpolated logarithmically with respect to pressure using the equation

$$T = T_U + (T_L - T_U) \frac{\ln p - \ln p_L}{\ln p_U - \ln p_L} \quad , \tag{54}$$

where the subscripts U and L indicate values at the nearest data levels in the actual sounding above and below the interpolated level.

B.2.3. Pressure

The pressure values in each radiosonde sounding were interpolated to the RRA data levels using the equation

$$p = p_L \exp\left(\frac{H_L - H_U}{29.2712617\ (0.5)\ (T_{v_U} + T_{v_L})}\right) \tag{55}$$

where the subscript L indicates virtual temperature, geopotential height, and pressure values at the data level below and closest to the level at which data were required.

B.2.4. Dewpoint Temperature

Dewpoint values were interpolated logarithmically with respect to pressure using the equation

$$T_d = T_{dU} + (T_{dL} - T_{dU}) \left(\frac{\ln p - \ln p_L}{\ln p_U - \ln p_L}\right) \quad . \tag{56}$$

The subscripts U and L indicate data at the nearest upper and lower data levels in a sounding.

B.2.5. Derived Water Vapor Pressure

The water vapor pressure was calculated from the interpolated dewpoint values at the RRA data levels using Teten's approximation:

$$e = 6.11 \text{ mb} \times 10^{7.5(T_d - 273.15)/(T_d - 35.86)} \quad . \qquad (57)$$

B.2.6. Derived Density

The density values derived from radiosonde observations were calculated at the RRA data levels using the equation

$$\rho = 348.36787\ p/T_v \quad . \qquad (58)$$

B.2.7. Derived Virtual Temperature

The virtual temperature values were calculated at the RRA data levels for each sounding using the equation

$$T_v = T/(1 - 0.379(e/p)) \quad , \qquad (59)$$

where T_v and T are in degrees Kelvin, and p and e are the pressure and vapor pressure, respectively, in millibars.

B.3. Calculations on the Original Rocketsonde Data Records

The rocketsonde data records used to calculate the RRA table values above 30 km were given in terms of geometric altitude. For this reason, slightly different calculations were required to convert the recorded data values to values at the RRA data levels. The pressure, temperature, and density were all interpolated to the RRA data levels; moisture-related parameters (virtual temperature, water vapor pressure, and dewpoint) were not calculated, since atmospheric moisture at altitudes above 30 km was considered to be negligible.

No interpolation was done across gaps in the pressure or temperature data within a sounding larger than 7,000 m. Data values at the RRA levels within such a gap were set to missing.

B.3.1. Temperature

Rocketsonde temperatures were interpolated linearly with respect to geometric altitude using the equation

$$T = T_U + (T_L - T_U) \frac{Z - Z_L}{Z_U - Z_L} \quad , \tag{60}$$

where the subscripts U and L indicate values at the nearest data level in the actual sounding above and below the interpolated level.

B.3.2. Pressure

The pressure values in each rocketsonde sounding were interpolated to the RRA data levels using the equation

$$P = P_L \exp\left(-\frac{g_\varphi}{R^*} \frac{M(Z - Z_L)}{\overline{T}v} \cdot W^2\right) \quad , \tag{61}$$

where $\overline{T}_v = \frac{T_{vU} + T_{vL}}{2}$ and $W = \frac{r^*}{\left(r^* + Z + \frac{Z - Z_L}{2}\right)}$.

B.3.3. Density

Rocketsonde density values were interpolated using the equation

$$\rho = \rho_L \exp\left(-\frac{g_\phi M}{R^*} \frac{(Z - Z_L)}{\overline{T}_v} \cdot W^2\right) \quad , \tag{62}$$

where W is specified in section III.B.3.2.

C. Computation of Statistical Parameters for Tables II and III

A three-step procedure was used for computing the monthly and annual means, standard deviations, and skewness values from the data values at the RRA data levels. Initially, certain statistical sums were calculated and stored as the soundings in the data base were processed. These sums were then used to calculate the monthly statistics given in the RRA tables. The annual statistics were then calculated from these stored sums and the monthly statistics.

C.1. Stored Statistical Sums

The sums calculated were

$$\sum Q, \ \sum Q^2, \text{ and } \sum Q^3 \quad ,$$

where Q is any one of the quantities given in the thermodynamic part of the RRA.

C.2. Calculation of the Monthly Statistics

C.2.1. Monthly Means

The mean monthly values of the thermodynamic RRA quantities were calculated using the equation

$$\bar{Q} = \sum Q/N_Q \quad ,$$

where N_Q is the number of observed values of the quantity Q for a given month.

C.2.2. Monthly Standard Deviations

The monthly standard deviations of the thermodynamic RRA quantities were calculated using the equation

$$\sigma_Q = \sqrt{\frac{(N_Q \Sigma' Q^2) - (\Sigma Q)^2}{N_Q \cdot (N_Q - 1)}} \quad . \qquad (63)$$

C.2.3. Monthly Skewness Values

The monthly skewness values of the windspeed and of the thermodynamic RRA quantities were calculated using the equation

$$\alpha_Q = \frac{M3_Q}{\sigma_Q^3} \quad ,$$

where $M3_Q$ is the third moment of the quantity Q, σ_Q is its standard deviation, and

$$M_{3Q} = \left[\frac{\Sigma_Q^3}{N_Q} - \frac{3\Sigma_Q \Sigma_Q^2}{N_Q^2} - \frac{2\Sigma_Q^3}{N_Q^3} \right] \cdot \frac{N_Q^2}{(N_Q - 1)(N_Q - 2)} \quad . \qquad (64)$$

C.3. Calculation of the Annual Statistics

Equations (63) and (64), used to calculate the monthly values of the standard deviations and skewness values, involve taking the differences between two pairs of large sums containing Q^2 and Q^3, where Q is any thermodynamic RRA quantity. Using these equations to compute the annual statistics would have resulted in a substantial loss of precision, as these sums become larger by several orders of magnitude in such a case. This problem was avoided by calculating the annual means, standard deviations, and skewness values from the monthly statistics.

C.3.1 Annual Mean Values

The annual mean values of the thermodynamic RRA quantities were calculated using the equation

$$Q_{ANN} = Q_A / N_Q \quad ,$$

where Q_A is the total of all observed values of Q and N_Q is the total number of observations of Q.

C.3.2. Annual Standard Deviations

The annual standard deviations of the thermodynamic RRA quantities were calculated using the equation

$$\sigma_{Q_{ANN}} = \sqrt{\frac{1}{N_Q} \sum_{i=1}^{12} (N_{Qi}\, \sigma_{Qi}^2) + \frac{1}{N_Q} \sum_{i=1}^{12} (N_{Qi}\, \bar{Q}_i^2) - Q_{ANN}^2} \quad , \qquad (65)$$

where N_{Qi} = the number of data values for Q in month i (i = 1 to 12), Q_i = the monthly mean of Q, and σ_{Qi} = the standard deviation of quantity Q in month i.

C.3.3. Annual Skewness Values

The annual skewness values of the thermodynamic RRA quantities were calculated using the equation

$$M3Q_{ANN} = \frac{1}{N} \sum_{i=1}^{12} (N_{Qi} M_{3Qi}) + \frac{3}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} \bar{Q}_i \sigma_{Qi}^2)$$

$$+ \frac{1}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} Q_i^3) - \frac{3\bar{Q}_{ANN}}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} Q_i^2)$$

$$- \frac{3\bar{Q}_{ANN}}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} \sigma_{Qi}^2) + 2\bar{Q}_{ANN}^3 \quad , \qquad (66)$$

where M_{3Qi} = the third moment about the mean of quantity Q in month i and $M3Q_{ANN}$ = the annual third moment about the mean of the quantity Q.

D. Derived Monthly Mean and Annual Mean Model Atmospheres

A set of modeled monthly mean and annual mean hydrostatic values of pressure and density was calculated from the lowest RRA data level (0 km, mean sea level) upwards to 30 km, and from 30 km upwards to 70 km. The integration from 0 to 30 km was computed independently of the integration from 30 to 70 km because of the difference in data sources. The two different values for 30 km are provided for comparison. When 30-km data are required, the values given in the 0- to 30-km table should be used. These hydrostatically modeled mean values, which are given in table IV, are useful as a check on the validity of the pressure and density values given in table II. In most cases, the values in tables II and IV for any given data level are within 1 percent of each other. The hydrostatic pressure values in table IV were calculated using the equation

$$p_1 = p_0 \exp\left(- \frac{0.034162 \, (H_1 - H_0)}{0.5 \, (T_{v_1} + T_{v_0})} \right) \quad , \qquad (67)$$

where $H_1 - H_0$ is in meters and a "0" subscript refers to values at the RRA data level immediately below the level being checked. p_0 at the lowest data level is set equal to the RRA mean pressure; p_1, calculated for the next highest data level, is taken as p_0 for the level above that. This process is repeated for all the other RRA data levels. The hydrostatic density corresponding to the hydrostatic pressures is calculated from these pressures and the RRA virtual temperature values using the formula

$$\rho_H = 348.36786 \, P_H / T_v \quad , \qquad (68)$$

where ρ_H and P_H are the hydrostatic density and pressure shown in table IV of the RRA.

E. Thermodynamic Quantities Derivable from the Basic Tables

Several other quantities can be calculated from the statistics listed in tables I and II. Primary physical constants used in these calculations are listed in table E. The equations given in this section can be used to calculate the approximate mean values of these quantities at each RRA data level. It is not possible to infer or derive any information concerning the standard deviation or skewness values of these quantities from the data in tables II and III of the RRA.

E.1. Mean Air Particle Speed

The mean air particle speed, V, is the arithmetic average of the speeds of all air particles in the volume element being considered. For a valid average to occur, there must be a sufficient number of particles involved to represent mean conditions. The equation for V for dry air is

$$V = \sqrt{\frac{8}{\pi} \cdot \frac{R^* T}{M}} \quad . \tag{69}$$

A computational form for dry air, using tabulated values, is

$$V = \sqrt{7.3094 \times 10^2 \times T} \text{ (meters per second)} \quad , \tag{70}$$

where T is the temperature in degrees Kelvin from table II. Equation (69), when corrected for moist air, becomes

$$V = \sqrt{\frac{8}{\pi} \cdot R' T_v} \quad . \tag{71}$$

The computational form for moist air is

$$V = \sqrt{7.3094 \cdot 10^2 \cdot T_v} \text{ (meters per second)} \quad , \tag{72}$$

where T_v is the virtual temperature in degrees Kelvin from table III.

TABLE E. LIST OF PRIMARY PHYSICAL CONSTANTS

P_o = standard atmospheric pressure at sea level
= 1.013250×10^5 Newton/m^2 = 2116.22 lb/ft^2

ρ_o = standard atmospheric density at sea level
= 1.2250 kg/m^3 = 0.076474 lb/ft^3

T_o = standard temperature at sea level = 288.15 K = 15.0°C = 59.0°F

g_o = standard gravity at sea level at latitude 45°32'33"
= 9.80665 m/s^2

S = Sutherland's constant used in calculation of dynamic viscosity
= 110.4 K

T_I = ice-point temperature at P_o = 273.15 K

β = constant used in calculation of dynamic viscosity
= 1.458×10^{-6} kg/s m $K^{\frac{1}{2}}$
= 7.3025×10^{-7} lb/s ft $R^{\frac{1}{2}}$

γ = ratio of specific heat of air at constant pressure to specific heat of air at constant volume
= 1.4

C_D = mean effective collision diameter of air molecules
= 3.65×10^{-10} m = 1.1975×10^{-9} ft

N_a = Avogadro's constant
= 6.022169×10^{26}/kg mol = 2.73179×10^{26}/lb mol

R^* = gas constant = 8.31432 J/mol K

R' = gas constant for dry air = 2.8704×10^2 J/kg K

M = molecular weight of dry air = 28.966 g/mol

E.2. Mean Free Path

The mean free path, L, is the mean value of the distance traveled by each neutral air particle in a selected air parcel, between successive collisions with other particles in that parcel. A meaningful average requires that the selected parcel be large enough to contain a substantial number of particles. The equation for L is given by

$$L = \left(\frac{\sqrt{2}}{2\pi}\right)\left(\frac{R^*T}{N_a C_d^2 P}\right) \quad , \tag{73}$$

where C_d is the effective collision diameter of the mean air molecules. The 1976 standard atmosphere value of 3.65×10^{-10} is valid for the range of altitudes in the RRA.

A computational form for moist air, using tabulated values, is

$$L = 2.335 \times 10^{-7} \frac{T}{P} \text{ (meters)} \quad , \tag{74}$$

where T is the temperature in degrees Kelvin from table II and P is the pressure in millibars from table II.

A form of (73) to correct L for moist air is

$$L = \left(\frac{\sqrt{2}}{2\pi}\right)\frac{R'MT_v}{N_a C_d^2} \quad . \tag{75}$$

The computational form for moist air is

$$L = 2.3325 \times 10^{-7} \frac{T_v}{P} \text{ (meters)} \quad , \tag{76}$$

where T_v is the virtual temperature in degrees Kelvin from table III and P is the pressure in millibars from table II.

E.3. Mean Collision Frequency

The mean collision frequency, V_c, is considered to be the average speed of air particles contained in an air parcel, divided by the mean free path of the particles inside that parcel. Computationally this is equivalent to

$$V_c = \frac{V}{L} \ (\sec^{-1}) \quad . \tag{77}$$

To determine V_c for dry air, use V and L from equations (70) and (74). To determine V_c for moist air, use V and L from equations (72) and (76).

E.4. Speed of Sound

The expression for the speed of sound, C_s, in meters per second in dry air, is

$$C_s = \sqrt{\frac{\gamma R^* T}{M}} \quad . \tag{78}$$

To compute C_s for dry air from tabulated values, use

$$C_s = \sqrt{4.0185 \times 10^2 \times T} \quad \text{(meters per second)} \quad , \tag{79}$$

where T is the temperature in degrees Kelvin from table II. One form for the speed of sound in moist air is

$$C_s = \sqrt{\gamma R' T_v} \quad . \tag{80}$$

where T_v is the virtual temperature from table III. A computational form for moist air is

$$C_s \quad \sqrt{4.0185 \times 10^2 \ T_v} \quad \text{(meters per second)} \quad , \tag{81}$$

E.5. Dynamic Coefficient of Viscosity

The coefficient of dynamic viscosity, μ, is defined as a coefficient of internal friction developed where gas regions move adjacent to each other at different velocities. The following expression is taken from the U.S. Standard Atmosphere (1976):

$$\mu = \frac{\beta \cdot T^{3/2}}{T + S} \quad . \tag{82}$$

The computational form is

$$\mu = \frac{(1.458 \times 10^{-6})\ T^{3/2}}{T + 110.4} \quad \text{(kilograms per second per meter)}, \tag{83}$$

where T is temperature degrees Kelvin from table II.

E.6. Kinematic Coefficient of Viscosity

The kinematic coefficient of viscosity, designated as η, is defined to be the ratio of the dynamic coefficient of viscosity of a gas to its density, or

$$\eta = \mu/\rho \quad . \tag{84}$$

The computational form is

$$\eta = 1.0 \times 10^{3}\ \mu/\rho \quad \text{(square meters per second)}, \tag{85}$$

where μ is the dynamic coefficient of viscosity from equation (83) and ρ is the density in grams per cubic meter from table II.

E.7. Coefficient of Thermal Conductivity

The empirical expression used for the coefficient of thermal conductivity, designated as K_t, is given in the 1976 Standard Atmosphere as

$$K_t = \frac{2.65019 \times 10^{-3} \cdot T^{3/2}}{T + 245.4 \times 10^{-(12/T)}} \quad \text{(watts per meter per degree Kelvin)}, \tag{86}$$

where T is in degrees Kelvin.

E.8. Refractive Modulus and Refractive Index

The refractive modulus or refractivity (Selby and McClatchey, 1975; Smith and Weintraub, 1953) is defined as N, where

$$N = (n - 1) \cdot 10^{6} \tag{87}$$

and n is the refractive index.

For microwave frequencies below approximately 30 GHz (equivalent to wavelengths above 1 cm), N, the refractive modulus, is given by the empirical equation

$$N = 77.6 \frac{P}{T_d} + 3.73 \times 10^5 \frac{e}{T^2} \text{ (dimensionless)}, \tag{88}$$

where E and P are in millibars and T and T_d are in degrees Kelvin.

The following expression is valid for the visible and infrared wavelengths shorter than approximately 30 μm (0.03 mm).

$$N = 77.6 \frac{P}{T} + 0.584 \frac{P}{T} \text{ (dimensionless)}, \tag{89}$$

where λ is the wavelength in microns and T is in degrees Kelvin.

The expression for N for the wavelength from 0.03 mm to 1 cm is an extremely complex function of wavelength.

CHAPTER IV. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This document satisfies the technical objectives established for the RRAC by the RCC MG. Upper air statistics and models for wind and thermodynamic quantities for the specific site have been derived in a consistent and uniform manner, which will be used in publications for all other assigned site locations. These RRAs represent an improvement over the previously published RRAs because of the availability of more extensive upper air data bases and the adaptation of more advanced statistical techniques. A statistical measure of central tendency (mean values) and a measure of dispersion (standard deviation with respect to the mean values) for monthly and annual reference periods have been tabulated for all variables in a consistent manner from data bases that have been edited and quality-controlled in the same manner. Further, a statistical measure for symmetry (skewness coefficient that involves the third statistical moment) has been tabulated for all variables except the U and V wind components. Even with these improvements, the user of these RRAs must recognize certain limitations of the statistical tabulations:

1) The wind profile structure with respect to altitude cannot be modeled from the RRA statistics because the interlevel and crosslevel correlations were not computed.

2) The profile structure with respect to altitude for any of the thermodynamic variables or any quantities derivable from these variables cannot be modeled because the prerequisite correlations were not computed. However, the profiles of monthly and annual means for pressure, virtual temperature, and density are in agreement (table IV) with the hydrostatic equation and the equation of state.

The preceding limitations are cited to prevent a misuse of the RRAs. More extensive statistical tabulations were beyond the scope of this committee's task. As greater insight is gained through usage of these RRAs, many adaptations of the statistical tabulations for specific engineering and scientific applications are envisioned.

Recommendations

It is recommended than the wind and thermodynamic statistical tabulations and attendant models contained in the RRAs be used as a standard reference source, as may be appropriate, by the ranges and range users. It is further recommended that the respective Range Staff Meteorologist or responsible agency staff member be consulted for the applicability of the RRAs for specific engineering applications.

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In addition to the documents above and the present RRA for Wallops Island, Virginia, the revised series will include RRAs for the following locations:

Edwards AFB, California
White Sands Missile Range, New Mexico
Point Mugu, California
Eglin AFB, Florida
Ascension Island, South Atlantic
Taquac (Guam)
Barking Sands, Hawaii

CONVERSION UNITS

Physical Constants and Conversion Factors

Numerical values in this document are given in the International System of Units (SI, Système International d'Unités). The values in parentheses are equivalent U.S. Customary Units, which are English units adapted for use by the United States of America. The SI and U.S. Customary Units provided in table F are those normally used for measuring and reporting atmospheric data.

By definition, the following fundamental conversion factors are exact:

Type	U.S. Customary Units	Metric
Length	1 U.S. yard (yd)	0.9144 meter (m)
Mass	1 avoirdupois pound (lb)	453.59237 gram (g)
Time	1 second (s)	1 second (s)
Temperature	1 degree Rankine (°R)	9/5 degree Kelvin (K)

To aid in the conversion of units, conversion factors based on the above fundamental conversion factors are given in table F.

TABLE F. FACTORS FOR CONVERSION UNITS

Type of Data	METRIC		U.S. CUSTOMARY		CONVERSION		
	Unit	Abbreviation	Unit	Abbreviation	Multiply	By	To Get
TEMPERATURE							
Ambient Temperature	degree Celsius	°C	degree Fahrenheit	°F	°F - 32	0.5556	°C
	degree Kelvin	K	degree Rankine	R	°C	1.8*	°F - 32
					°R	1.00*	F + 459.67
					R - 459.67	1.00*	F
					K	1.00*	°C + 273.15
					K - 273.15	1.00*	°C
Temperature Change	degree Celsius	°C	degree Fahrenheit	°F	°C or K	1.8*	temp. change °F or R
	degree Kelvin	K	degree Rankine	R	°F or R	0.5556	temp. change °C or K
DENSITY							
Water Vapor Vapor Concentration (Absolute Humidity) and Ambient Density	gram per cubic meter	$g\ m^{-3}$	grain per cubic foot	$gr\ ft^{-3}$	$g\ m^{-3}$	0.437**	$gr\ ft^{-3}$
	gram per cubic centimeter	$g\ cm^{-3}$			$gr\ ft^{-3}$	2.288	$g\ m^{-3}$
					$g\ m^{-3}$	10^{-6}*	$g\ cm^{-3}$
					$g\ cm^{-3}$	4.370×10^{3}	$gr\ ft^{-3}$
					$gr\ ft^{-3}$	2.288×10^{-6}	$g\ cm^{-3}$
WIND							
Windspeed	meter per second	$m\ s^{-1}$	mile per hour	mph	$m\ s^{-1}$	2.2369	mph
			knots	knots	mph	0.44704*	$m\ s^{-1}$
			feet per second	$ft\ s^{-1}$	$m\ s^{-1}$	1.9438	knots
					knots	0.51444	$m\ s^{-1}$
					mph	0.868976	knots
					knots	1.15078	mph
					$m\ s^{-1}$	3.2808	$ft\ s^{-1}$
					$ft\ s^{-1}$	0.3048*	$m\ s^{-1}$
DISTANCE							
Length	meter	m	feet	ft	m	3.2808	ft
	micron	μ	inch	in.	ft	0.3048*	m
	Angstrom unit	Å			m	2.54×10^{-4}*	μ
					in.	2.54×10^{-8}*	Å
					μ	10^{-6}*	m
					Å	10^{-10}*	m

* Defined exact conversion factor

TABLE F. (continued)

Type of Data	METRIC		U.S. CUSTOMARY		CONVERSION		
	Unit	Abbreviation	Unit	Abbreviation	Multiply	By	To Get
DISTANCE (Concluded)					μ	10^{-6}*	m
					μ	3.937×10^{-5}	in.
					Å	10^{-10}*	m
					Å	3.937×10^{-9}	in.
MASS							
Weight	gram	g	grain	gr	lb	0.45359237*	kg
	kilogram	kg	pound	lb	lb	453.59237*	g
					kg	2.20462	lb
					g	15.4324	gr
					gr	0.064800	g
PRESSURE							
Atmospheric	newton per square meter	newton m^{-2}	pound force per square inch	lb $in.^{-2}$	mb	10^{-3}*	bar
					bar	10^{3}*	mb
	millimeter of Mercury	mmHg	inch of Mercury	in.Hg	newton m^{-2}	10^{-2}*	mb
					newton m^{-2}	1.4504×10^{-4}	lb $in.^{-2}$
					lb $in.^{-2}$	6.8948×10^{3}	newton m^{-2}
	bar	bar			mb	1.4504×10^{-2}	lb $in.^{-2}$
	millibar	mb			lb $in.^{-2}$	68.948	mb
	dyne per square centimeter (microbar)	dyne cm^{-2}			mb	10^{3}	dyne cm^{-2}
					dyne cm^{-2}	10^{-3}	mb
	kilogram force per square meter	kg m^{-2}			lb $in.^{-2}$	6.8948×10^{-3}	dyne cm^{-2}
					dyne cm^{-2}	1.4504×10^{-5}	lb $in.^{-2}$
					mb	10.1972	kg m^{-2}
					kg m^{-2}	0.09806 65	mb
					lb $in.^{-2}$	703.0696	kg m^{-2}
					kg m^{-2}	0.001422 3	lb $in.^{-2}$
					mb	$2.953 0 \times 10^{-2}$	m.Hg (32 °F)
					mb	0.750 06	mm Hg (0 °C)
					m.Hg (32 °F)	25.40	mm Hg (0 °C)
					m.Hg (0 °C)	1.033 22	mb
					m Hg (32 °F)	33.863 9	mb
	pascal	Pa			Pa	1.000	newton m^{-2}

* Defined exact conversion factor

TABLE I-1. WIND STATISTICAL PARAMETERS

JANUARY

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	1.63	3.38	-.0212	-1.10	3.90	4.69	2.91	.85	499.
1.000	7.71	7.10	.1503	-.98	8.61	12.07	6.24	.69	492.
2.000	12.43	6.50	.1781	.25	8.38	15.20	5.96	.41	495.
3.000	17.37	7.42	.1850	1.03	9.76	20.10	6.99	.19	494.
4.000	21.74	9.09	.1670	1.73	11.14	24.63	8.67	.11	498.
5.000	25.73	11.05	.1649	2.12	12.39	28.78	10.66	.21	494.
6.000	29.51	12.60	.1576	2.73	14.07	32.93	12.27	.20	490.
7.000	33.25	14.19	.1800	2.81	15.43	36.90	13.83	.24	484.
8.000	36.25	15.26	.1411	2.80	16.89	40.24	14.84	.22	462.
9.000	38.89	16.25	.1487	2.76	17.84	43.00	15.90	.40	433.
10.000	40.11	16.10	.1041	2.18	18.18	44.26	15.58	.37	392.
11.000	40.70	15.42	.1291	1.19	17.32	44.42	14.90	.37	354.
12.000	40.70	14.37	.1183	.55	16.21	43.89	14.10	.30	345.
13.000	38.17	12.25	.1309	1.11	13.22	40.51	11.89	.30	336.
14.000	35.03	10.95	.1358	1.20	11.19	36.91	10.49	.16	326.
15.000	31.46	9.86	.1955	1.33	9.64	33.00	9.62	.14	316.
16.000	28.07	8.38	.1455	1.41	8.61	29.41	8.32	.04	316.
17.000	24.23	7.52	.1552	1.07	7.31	25.33	7.52	.16	304.
18.000	19.97	7.21	.1642	.83	6.47	20.99	7.25	.42	302.
19.000	16.62	7.10	.2990	.42	5.79	17.57	7.17	.58	299.
20.000	14.07	7.31	.3469	.04	5.15	15.03	7.20	.68	299.
21.000	12.09	7.71	.3745	-.16	4.85	13.20	7.41	.55	302.
22.000	10.60	8.52	.3776	-.30	5.12	12.43	7.53	.62	308.
23.000	10.02	9.21	.3870	-.54	5.17	12.35	7.72	.74	308.
24.000	9.85	10.23	.3760	-.70	5.58	12.91	8.15	.82	307.
25.000	9.60	11.12	.3996	-.62	6.03	13.46	8.44	.89	296.
26.000	10.41	12.20	.4167	-.42	6.38	14.77	8.93	.88	294.
27.000	11.12	13.45	.3993	-.18	7.18	16.15	9.74	.72	250.
28.000	11.73	14.45	.3480	-.03	8.03	17.29	10.55	.61	243.
29.000	13.82	16.66	.3758	-.33	8.64	19.67	12.33	.58	174.
30.000	15.57	17.61	.3960	-.56	9.09	21.07	13.81	.64	163.
32.000	19.16	21.28	.4849	2.27	10.00	24.61	17.84	.61	159.
34.000	22.86	23.18	.5337	2.02	11.06	28.20	19.73	.69	159.
36.000	25.88	24.24	.5279	1.84	11.00	30.97	20.52	.74	160.
38.000	29.67	25.30	.5457	3.37	13.28	34.73	22.37	.83	161.
40.000	32.84	25.12	.5169	5.79	16.11	38.44	22.87	.65	161.
42.000	37.59	26.18	.4794	9.14	17.94	43.75	24.23	.35	161.
44.000	43.18	27.31	.3700	13.25	18.94	50.07	25.20	.19	162.
46.000	49.12	28.46	.3447	14.32	19.33	56.73	26.32	.19	163.
48.000	53.19	29.35	.2462	14.40	20.20	59.66	27.28	.03	164.
50.000	55.89	30.04	.2259	14.57	19.98	62.31	27.41	-.14	162.
52.000	56.77	28.46	.2382	14.96	19.43	62.92	25.91	-.18	154.
54.000	58.01	28.10	.3092	14.69	19.19	63.80	25.81	-.15	147.
56.000	58.99	28.48	.3403	13.15	19.64	64.33	26.75	-.12	139.
58.000	59.95	28.59	.3035	13.16	18.32	65.08	26.12	-.08	127.
60.000	62.91	31.77	.4275	12.81	16.45	67.89	28.05	.21	98.
62.000	63.47	33.66	.4134	8.34	16.11	67.62	30.20	-.19	77.
64.000	64.06	36.58	.1248	4.45	14.09	67.78	32.53	-.25	65.
66.000	64.64	36.19	-.0928	-.42	17.53	68.92	32.16	-.28	50.
68.000	62.14	35.20	.0143	-2.52	18.46	66.08	32.69	-.16	39.
70.000	57.50	33.50	.0259	-3.48	19.90	61.69	31.83	.22	29.

TABLE I-2. WIND STATISTICAL PARAMETERS

FEBRUARY

STATION = 724020		WALLOPS ISLAND							
Z	MEAN U	S.D. U	R(U,V)	MEAN V	S.D. V	MEAN WS	S.D. WS	SKEW WS	NOBS
KM	M/S	M/S		M/S	M/S	M/S	M/S		
.003	1.74	3.97	-.0346	-1.44	4.10	5.25	3.16	.90	470.
1.000	7.05	7.58	.0470	-2.12	8.04	11.82	6.02	.64	473.
2.000	11.63	6.89	.0378	-.82	8.47	14.73	6.16	.47	476.
3.000	16.62	8.06	.0692	.52	9.44	19.35	7.46	.36	476.
4.000	21.20	9.92	.0266	1.20	10.70	23.99	9.37	.18	475.
5.000	25.00	11.83	.0457	1.64	12.13	28.04	11.31	.30	475.
6.000	28.87	13.67	.0701	1.81	13.73	32.24	13.12	.33	470.
7.000	32.58	15.51	.1296	2.80	15.13	36.28	14.89	.33	454.
8.000	35.45	17.00	.1055	3.30	17.06	39.80	16.21	.30	427.
9.000	38.39	18.28	.0874	3.73	18.38	43.04	17.49	.34	411.
10.000	40.77	17.88	.0689	3.53	18.21	44.92	17.52	.39	390.
11.000	40.53	16.58	.0080	2.36	17.20	44.12	16.47	.66	354.
12.000	40.27	14.82	.0132	1.68	15.39	43.15	14.78	.41	338.
13.000	38.01	13.22	.0444	1.65	13.04	40.23	13.18	.33	331.
14.000	35.00	11.54	.0548	1.53	10.55	36.62	11.42	.42	320.
15.000	31.49	10.35	.0230	1.50	9.00	32.83	10.22	.56	320.
16.000	27.98	8.98	.0197	1.47	7.87	29.15	8.83	.27	318.
17.000	24.23	7.92	-.0253	1.10	6.27	25.09	7.79	.40	315.
18.000	20.57	7.46	-.0091	.64	5.24	21.25	7.40	.29	315.
19.000	17.36	7.27	.0160	.52	4.71	18.04	7.14	.23	313.
20.000	14.73	7.44	.0610	.30	4.24	15.45	7.18	.44	315.
21.000	12.44	7.44	.1634	.09	4.01	13.30	7.03	.54	311.
22.000	11.15	8.06	.2069	.04	4.09	12.44	7.16	.56	304.
23.000	10.14	8.82	.2808	-.03	3.95	11.97	7.26	.74	304.
24.000	9.51	9.80	.2808	-.03	4.27	12.07	7.68	.80	306.
25.000	9.35	10.66	.3326	.34	4.60	12.54	8.06	.79	299.
26.000	9.84	11.56	.3872	.61	4.81	13.40	8.61	.79	294.
27.000	10.93	12.43	.4331	.78	5.41	14.79	9.20	.72	259.
28.000	12.63	13.34	.4297	1.06	6.25	16.66	9.99	.72	257.
29.000	14.63	14.84	.4817	1.82	5.97	18.84	10.83	.65	180.
30.000	17.18	15.93	.5639	1.79	6.14	21.28	11.66	.53	167.
32.000	24.19	17.17	.5819	3.30	9.10	28.09	13.52	.23	109.
34.000	30.21	19.77	.5529	3.24	10.15	34.44	15.10	.18	109.
36.000	34.88	22.45	.5154	1.59	11.42	39.41	17.25	.11	108.
38.000	38.07	25.29	.4543	.60	13.45	43.22	19.96	-.05	108.
40.000	40.30	27.92	.4414	3.27	15.51	46.44	22.20	-.18	108.
42.000	43.72	29.44	.3930	6.61	18.13	51.07	23.15	-.26	108.
44.000	47.10	29.08	.3964	9.86	18.65	54.63	22.78	-.36	107.
46.000	51.77	28.34	.3970	13.61	17.33	58.72	22.70	-.31	106.
48.000	55.84	27.93	.3388	15.76	16.84	62.05	24.00	-.42	106.
50.000	58.21	28.30	.2588	14.85	16.38	64.08	23.82	-.42	105.
52.000	59.62	27.52	.2913	13.64	17.13	65.07	23.53	-.40	104.
54.000	60.68	26.03	.3062	13.67	18.04	65.75	23.33	-.45	99.
56.000	62.89	24.41	.3634	13.53	17.08	67.13	22.73	-.21	95.
58.000	63.56	23.64	.4360	13.06	19.56	68.47	21.41	-.27	86.
60.000	66.39	24.98	.4910	13.35	20.87	72.13	20.81	-.31	68
62.000	69.01	28.47	.4267	10.62	20.40	74.17	24.27	.11	53.
64.000	69.69	27.23	.3349	3.72	18.79	73.49	23.49	-.20	43.
66.000	72.30	22.47	.0353	-2.62	20.53	75.28	21.95	-.34	36.
68.000	71.01	21.70	-.4021	-8.46	18.19	73.69	21.83	-.21	32.
70.000	62.96	27.88	-.6340	-10.28	20.45	66.61	28.49	.01	23.

TABLE I-3. WIND STATISTICAL PARAMETERS

MARCH

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	.83	4.07	-.0779	-.77	4.41	5.19	3.22	1.05	512.
1.000	6.52	7.58	.0957	-1.31	8.92	11.82	6.45	.77	510.
2.000	10.33	6.31	.0995	-.58	8.97	13.87	5.90	.41	513.
3.000	14.06	7.31	.0878	-.42	9.77	17.38	6.68	.07	512.
4.000	17.85	8.80	.0946	-.49	10.69	21.09	8.12	.00	515.
5.000	21.15	10.47	.1162	-.60	12.11	24.64	9.83	.29	516.
6.000	24.24	12.29	.1490	-.79	13.56	28.02	11.75	.56	517.
7.000	26.73	13.62	.1505	-1.52	14.61	30.79	12.95	.55	505.
8.000	29.27	14.85	.1384	-1.65	16.11	33.78	14.07	.50	495.
9.000	32.42	15.91	.1407	-2.03	17.13	37.05	15.11	.53	488.
10.000	34.35	15.96	.0848	-2.74	17.55	38.93	15.16	.51	468.
11.000	35.67	15.67	.1010	-3.13	17.34	40.06	14.93	.62	452.
12.000	35.83	15.24	.1088	-3.68	15.72	39.55	14.55	.80	442.
13.000	32.98	12.94	.1087	-3.39	12.78	35.70	12.45	.61	429.
14.000	30.10	10.82	.1157	-2.28	10.40	32.06	10.42	.53	427.
15.000	27.15	9.38	.1399	-1.85	9.03	28.75	9.13	.52	426.
16.000	23.75	8.14	.1208	-1.63	7.61	25.06	7.92	.33	425.
17.000	20.13	7.63	.1238	-1.39	6.37	21.22	7.44	.55	420.
18.000	16.16	7.68	.0393	-1.35	5.35	17.17	7.48	1.04	419.
19.000	12.52	6.65	.0153	-1.25	4.59	13.49	6.44	.94	419.
20.000	9.62	5.63	.0190	-1.13	4.02	10.61	5.40	.77	416.
21.000	7.75	5.81	.0124	-1.07	3.58	8.89	5.37	1.26	416.
22.000	6.54	6.73	.0131	-1.23	3.61	8.42	5.63	1.70	412.
23.000	5.85	6.79	.0330	-1.21	3.25	7.76	5.66	1.94	407.
24.000	5.41	7.73	.0514	-1.05	3.49	8.06	6.10	1.91	404.
25.000	5.37	8.45	.1727	-.78	3.52	8.57	6.29	1.65	393.
26.000	5.82	9.06	.2968	-.48	3.60	9.22	6.63	1.72	373.
27.000	6.65	9.96	.3735	-.20	3.75	10.39	7.03	1.54	319.
28.000	7.46	11.01	.3656	-.33	4.00	11.65	7.55	1.21	315.
29.000	8.72	12.26	.4610	-.19	4.27	13.36	8.11	.91	228.
30.000	10.79	13.82	.4999	-.03	4.85	15.66	9.22	1.04	220.
32.000	17.55	15.99	.5552	1.44	5.82	20.74	12.99	.62	135.
34.000	23.53	18.92	.5077	1.18	6.26	26.43	15.88	.48	134.
36.000	28.19	21.60	.2693	.60	6.65	31.01	18.53	.38	134.
38.000	31.34	23.25	.0687	1.07	8.03	34.22	20.38	.37	134.
40.000	35.41	24.34	.1865	3.45	9.61	38.25	22.04	.20	134.
42.000	38.28	24.59	.2356	5.62	11.03	41.32	22.68	-.01	134.
44.000	40.43	24.30	.2623	7.34	11.76	43.25	23.35	-.10	134.
46.000	40.64	23.92	.2088	8.55	12.92	44.23	22.49	-.13	131.
48.000	40.44	23.70	.1462	10.01	12.46	44.37	21.95	-.24	129.
50.000	40.58	23.66	.1323	10.62	11.08	44.36	21.73	-.23	125.
52.000	39.82	22.57	.0481	10.82	13.18	44.40	20.29	-.24	123.
54.000	37.94	21.35	.1048	12.18	14.56	43.13	19.82	.01	119.
56.000	38.67	22.63	.1482	13.30	14.51	44.33	20.67	-.05	106.
58.000	37.72	23.63	.1717	11.19	12.03	43.05	19.85	.21	92.
60.000	37.41	26.48	.3007	9.09	11.02	42.79	21.64	.51	76.
62.000	33.82	26.65	.4202	7.02	10.42	39.36	21.36	.17	53.
64.000	29.29	27.95	.4167	3.64	12.51	36.42	21.76	.59	48.
66.000	26.24	29.46	.1908	3.66	14.94	35.40	22.95	.51	43.
68.000	22.44	31.26	.0187	-.65	14.40	33.00	24.12	.90	33.
70.000	17.95	34.65	-.0435	-2.03	17.41	34.09	25.11	1.11	23.

TABLE I-4. WIND STATISTICAL PARAMETERS

APRIL

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	.65	3.78	-.0136	-.52	4.08	4.82	2.89	1.08	510.
1.000	5.84	7.02	.2329	-1.90	7.43	10.39	5.84	.92	512.
2.000	9.01	6.56	.1348	-2.03	7.78	12.45	5.81	.71	515.
3.000	12.17	7.24	.1323	-1.94	8.87	15.44	6.66	.43	515.
4.000	15.14	8.36	.1686	-2.23	9.74	18.40	7.77	.42	515.
5.000	17.98	9.81	.1717	-2.84	10.83	21.43	9.24	.39	514.
6.000	20.74	11.35	.1578	-3.33	12.36	24.59	10.85	.48	513.
7.000	23.26	12.87	.1454	-3.71	14.29	27.69	12.54	.57	512.
8.000	25.69	13.98	.1255	-4.07	15.93	30.72	13.47	.42	506.
9.000	28.16	15.31	.1450	-4.40	17.37	33.63	14.71	.45	500.
10.000	29.96	15.73	.1448	-5.26	17.78	35.53	14.79	.34	486.
11.000	30.46	14.98	.1295	-6.52	17.64	36.15	14.08	.33	471.
12.000	30.14	14.02	.1134	-7.09	16.48	35.28	13.47	.57	465.
13.000	27.73	11.89	.1514	-6.15	13.63	31.65	11.48	.72	462.
14.000	24.80	9.85	.2132	-4.35	10.92	27.59	9.42	.76	460.
15.000	21.83	8.70	.2301	-3.27	9.18	24.01	8.41	.54	458.
16.000	18.64	7.63	.2254	-3.19	7.71	20.52	7.34	.45	455.
17.000	14.89	6.92	.2246	-2.73	6.49	16.58	6.64	.50	450.
18.000	11.08	6.23	.1999	-2.39	5.57	12.81	5.85	.46	450.
19.000	7.89	5.73	.2003	-2.00	4.74	9.72	5.19	.87	453.
20.000	5.43	5.37	.2426	-1.65	3.88	7.48	4.49	1.10	440.
21.000	3.47	5.02	.2713	-1.36	3.34	5.99	3.79	1.26	430.
22.000	2.27	5.11	.2362	-1.13	3.13	5.46	3.52	1.27	428.
23.000	1.87	5.25	.3469	-.92	2.87	5.29	3.47	.98	414.
24.000	1.68	5.92	.3944	-.68	3.15	5.82	3.78	1.00	410.
25.000	1.73	6.30	.3260	-.48	3.16	6.11	3.93	1.11	404.
26.000	2.54	6.40	.3517	-.42	3.33	6.42	4.16	1.00	382.
27.000	3.85	6.89	.3806	-.22	3.58	7.26	4.72	1.11	328.
28.000	5.35	7.40	.3549	.04	3.74	8.17	5.53	.92	325.
29.000	6.89	7.61	.3128	.26	4.03	9.17	6.12	.79	223.
30.000	8.72	8.00	.2731	.37	4.46	10.50	7.05	.71	213.
32.000	12.13	8.10	.2427	1.51	4.61	13.21	7.84	.73	132.
34.000	14.82	10.47	.1537	1.12	4.62	16.06	9.67	.67	132.
36.000	16.39	13.07	-.0791	.47	5.25	18.11	11.78	.94	131.
38.000	16.46	14.40	.0016	1.00	5.91	18.69	12.82	1.20	131.
40.000	15.82	14.73	.1482	2.18	6.57	18.39	13.28	1.16	132.
42.000	16.12	15.54	.2129	2.77	7.05	19.02	14.01	1.07	132.
44.000	14.31	16.21	.2969	3.83	8.13	18.67	14.09	.90	132.
46.000	13.83	16.63	.2566	4.01	7.14	18.42	13.96	.95	132.
48.000	12.22	16.90	.1390	4.35	7.36	18.39	12.98	.88	132.
50.000	10.15	16.62	.3243	4.65	6.26	16.80	12.52	1.02	131.
52.000	7.06	15.74	.1654	6.67	7.59	16.52	11.21	1.19	128.
54.000	5.16	14.65	.2768	8.23	7.47	15.88	10.53	.98	121.
56.000	3.85	14.82	.3223	9.25	8.05	16.39	10.71	1.11	110.
58.000	4.93	15.07	.4462	7.88	9.15	16.60	10.93	1.40	99.
60.000	3.17	16.92	.3880	7.11	8.97	16.57	12.24	1.51	72.
62.000	-.29	15.47	.4081	7.52	8.40	16.20	10.00	1.32	51.
64.000	.62	16.25	.1312	5.79	8.59	16.33	9.95	1.24	39.
66.000	-4.37	13.28	-.4252	2.68	11.36	15.13	9.79	.66	31.
68.000	-9.39	14.28	-.4415	2.54	10.77	18.00	9.02	.33	26.
70.000	-11.31	14.04	-.2173	.97	13.51	18.79	11.96	.43	19.

TABLE I-5. WIND STATISTICAL PARAMETERS

MAY

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	-.02	3.28	.1541	-.11	3.85	4.37	2.54	.76	539.
1.000	3.59	6.53	.2335	-.87	6.67	8.68	5.03	.77	529.
2.000	6.46	6.51	.1449	-.44	6.50	10.01	5.12	.70	533.
3.000	8.84	7.39	.1664	-.04	7.22	12.18	6.05	.50	533.
4.000	10.89	8.37	.2249	-.07	8.31	14.33	7.23	.53	534.
5.000	12.61	9.35	.2086	.20	9.34	16.22	8.40	.69	534.
6.000	14.22	10.10	.2066	.41	10.29	18.05	9.17	.76	535.
7.000	15.62	10.93	.1860	.58	11.78	19.97	10.17	.72	535.
8.000	17.12	12.19	.1388	.60	13.44	22.18	11.42	.58	533.
9.000	18.77	13.35	.1287	.79	14.82	24.44	12.37	.45	528.
10.000	20.41	14.07	.1013	.36	15.65	26.42	12.69	.24	523.
11.000	22.05	14.59	.0863	-.20	16.36	28.18	13.12	.17	519.
12.000	23.10	14.65	.0783	-1.28	16.32	28.92	13.39	.27	519.
13.000	21.16	12.43	.1239	-1.48	13.93	25.82	11.48	.43	515.
14.000	18.67	10.48	.1875	-.68	10.65	21.89	9.63	.49	510.
15.000	15.97	8.64	.2157	-.92	8.54	18.53	7.74	.26	510.
16.000	13.01	7.65	.2346	-1.10	7.04	15.32	6.61	.42	508.
17.000	9.96	6.63	.2007	-1.31	5.87	12.12	5.67	.55	504.
18.000	6.73	5.72	.1799	-1.54	5.04	9.11	4.78	.78	500.
19.000	3.61	4.84	.1968	-1.17	4.03	6.39	3.64	1.01	497.
20.000	1.55	4.30	.2103	-.81	3.30	4.95	2.81	1.00	494.
21.000	.04	4.06	.1674	-.53	2.72	4.23	2.50	1.01	481.
22.000	-.97	3.81	.2018	-.28	2.40	4.00	2.30	.80	480.
23.000	-1.56	3.59	.1854	-.27	2.11	3.86	2.22	.93	464.
24.000	-2.12	3.85	.1211	-.32	2.33	4.30	2.52	1.16	459.
25.000	-2.26	4.07	.1941	-.40	2.16	4.36	2.73	1.47	448.
26.000	-2.09	4.44	.2248	-.33	2.15	4.47	2.97	2.01	418.
27.000	-1.58	5.19	.1559	-.19	2.57	4.98	3.34	2.06	360.
28.000	-1.05	5.73	.1615	-.18	2.51	5.17	3.67	2.02	357.
29.000	-.71	6.55	.1596	.24	2.72	5.73	4.23	1.94	247.
30.000	-.18	6.77	.1877	.47	2.54	5.83	4.28	1.69	235.
32.000	.10	6.62	.1303	1.48	2.40	6.26	3.52	1.20	164.
34.000	.19	7.11	.0280	1.01	3.00	6.71	3.92	1.02	162.
36.000	-1.09	7.69	.0329	.82	2.76	7.04	4.33	.60	162.
38.000	-3.34	7.02	-.0608	.49	3.16	7.15	4.41	.94	163.
40.000	-5.45	7.13	.0290	.59	3.51	8.06	5.29	.99	162.
42.000	-7.96	7.21	.0308	1.03	4.47	10.12	5.81	.47	164.
44.000	-10.20	7.98	.0397	3.01	4.71	12.40	6.70	.50	165.
46.000	-11.93	9.06	.1403	4.10	4.14	14.46	7.00	.32	167.
48.000	-13.52	8.09	.0228	4.35	4.89	15.52	7.07	.20	166.
50.000	-15.56	8.05	.1169	4.65	5.76	17.49	7.46	.41	162.
52.000	-17.26	8.85	-.0058	4.55	5.71	18.94	8.40	.21	159.
54.000	-19.35	8.33	.1386	4.77	6.46	21.11	7.89	.22	154.
56.000	-22.08	9.88	.0362	4.51	7.23	23.86	9.39	.42	142.
58.000	-24.35	10.36	-.1872	3.95	8.05	25.90	10.45	.40	133.
60.000	-24.86	10.83	-.0612	4.71	8.54	26.83	10.47	.15	118.
62.000	-27.44	10.74	.0660	4.81	9.29	29.42	10.54	-.17	91.
64.000	-30.15	11.23	.0030	4.26	8.34	31.81	10.50	-.06	77.
66.000	-33.32	12.34	-.2361	2.72	8.43	34.69	11.69	-.43	67.
68.000	-34.93	12.22	-.0800	.72	11.21	36.78	11.87	-.31	58.
70.000	-35.36	15.70	-.1660	-.30	11.37	37.71	14.17	.26	45.

TABLE I-6. WIND STATISTICAL PARAMETERS

JUNE

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	.17	2.76	.1887	.50	3.57	3.91	2.32	1.20	513.
1.000	3.12	5.83	.3169	-.36	5.07	7.20	4.19	.96	506.
2.000	4.30	5.86	.2334	-.31	5.21	7.93	4.13	.63	506.
3.000	5.94	6.28	.2377	-.25	5.83	9.22	4.85	.52	506.
4.000	7.49	6.93	.2463	-.16	6.48	10.55	5.88	.47	505.
5.000	8.60	7.58	.2344	-.13	7.36	11.82	6.75	.56	505.
6.000	9.63	8.17	.2453	.08	7.93	12.92	7.44	.67	505.
7.000	10.56	8.92	.2662	.22	9.15	14.29	8.39	.91	505.
8.000	11.46	10.01	.2600	.41	10.36	15.78	9.48	.94	503.
9.000	12.64	11.41	.2821	.58	11.71	17.57	10.88	.94	500.
10.000	13.70	12.78	.2879	.43	13.22	19.44	12.14	.92	498.
11.000	14.58	13.67	.2787	-.05	14.32	21.04	12.71	.78	494.
12.000	15.35	14.06	.2464	-1.21	14.55	22.02	12.69	.58	493.
13.000	14.85	13.13	.2219	-2.24	13.56	21.17	11.55	.49	489.
14.000	13.02	10.74	.1979	-2.42	10.32	17.68	9.18	.43	488.
15.000	10.53	8.35	.2331	-2.17	8.42	14.36	7.06	.51	486.
16.000	7.51	6.58	.2427	-2.22	6.70	10.94	5.46	.69	485.
17.000	4.27	5.36	.2464	-1.99	5.09	7.70	4.17	.98	484.
18.000	1.17	4.43	.2095	-1.57	4.09	5.49	3.17	.88	483.
19.000	-1.37	3.61	.2043	-1.05	3.03	4.42	2.38	.73	478.
20.000	-3.30	3.04	.1348	-.81	2.34	4.59	2.28	.51	474.
21.000	-5.00	3.06	.1081	-.47	2.14	5.69	2.59	.44	470.
22.000	-6.11	2.91	.0283	-.27	1.89	6.52	2.64	.38	469.
23.000	-6.81	2.89	.0517	-.20	1.73	7.11	2.65	.23	456.
24.000	-7.27	3.07	.0839	-.16	1.87	7.63	2.76	.02	455.
25.000	-7.77	3.24	.0965	-.23	1.87	8.08	3.03	.01	444.
26.000	-8.34	3.34	.0853	-.26	1.78	8.58	3.19	-.02	431.
27.000	-8.94	3.73	.0680	-.20	1.94	9.22	3.56	.21	399.
28.000	-9.43	3.72	.0601	.00	1.68	9.63	3.57	.07	383.
29.000	-10.05	3.92	-.0148	.22	2.19	10.35	3.76	-.01	287.
30.000	-10.38	3.87	.0495	.33	1.99	10.62	3.75	-.20	251.
32.000	-12.62	4.61	-.0345	.64	2.68	13.03	4.29	-.22	126.
34.000	-15.04	4.65	.0474	.62	3.03	15.37	4.61	-.58	125.
36.000	-17.38	5.17	.2089	.87	3.33	17.77	4.97	-.55	125.
38.000	-20.12	6.26	.1294	.59	3.31	20.44	6.14	-.38	124.
40.000	-23.85	6.51	-.2767	1.04	3.93	24.20	6.46	-.36	124.
42.000	-27.18	5.97	-.1706	2.08	4.16	27.57	5.97	-.05	125.
44.000	-29.52	5.76	.1690	3.29	4.46	30.06	5.67	-.08	127.
46.000	-31.68	7.21	.2668	5.02	5.04	32.59	6.62	-.03	127.
48.000	-33.97	8.04	.1009	5.01	4.81	34.70	7.92	-.57	128.
50.000	-35.61	7.51	-.1069	4.85	5.46	36.34	7.53	-.19	127.
52.000	-39.39	8.16	-.0887	4.76	6.24	40.17	8.11	.13	125.
54.000	-43.12	9.26	-.0889	5.10	7.00	43.97	9.31	-.05	119.
56.000	-46.26	9.57	-.0020	4.27	7.26	47.03	9.49	.27	112.
58.000	-50.06	12.84	-.0500	4.10	8.13	50.90	12.75	.49	100.
60.000	-54.29	13.34	-.0611	3.64	7.91	55.02	13.15	.29	85.
62.000	-56.39	13.44	.0268	2.50	8.19	57.08	13.21	.09	61.
64.000	-58.19	14.92	-.0669	6.14	11.28	59.56	14.60	.28	43.
66.000	-61.30	15.77	-.2989	7.94	11.53	62.83	15.82	.71	36.
68.000	-59.98	15.17	-.3222	3.89	15.18	62.04	14.70	.44	27.
70.000	-54.57	17.35	-.2968	1.60	17.04	57.20	16.88	1.18	20.

TABLE I-7. WIND STATISTICAL PARAMETERS

JULY

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	.23	2.34	.1429	.47	3.14	3.44	1.94	.51	556.
1.000	2.81	4.76	.2767	-.34	4.48	6.25	3.41	.91	548.
2.000	4.63	4.56	.2313	-.26	4.84	7.18	3.76	.66	549.
3.000	6.67	5.13	.2654	-.09	5.15	8.75	4.56	.59	550.
4.000	8.07	5.56	.2404	.25	5.61	10.03	5.19	.58	552.
5.000	8.82	5.82	.2890	.69	6.24	10.99	5.52	.58	552.
6.000	9.50	6.45	.3055	.89	6.95	12.03	6.00	.53	553.
7.000	10.22	7.22	.2867	1.05	7.89	13.20	6.74	.67	552.
8.000	11.01	8.19	.2961	1.02	9.11	14.62	7.64	.63	552.
9.000	11.84	9.37	.3212	.87	10.71	16.39	8.64	.63	550.
10.000	12.69	10.62	.3666	.59	12.50	18.28	9.80	.64	549.
11.000	13.46	11.84	.3791	-.05	13.84	20.11	10.39	.55	545.
12.000	14.04	12.38	.3861	-1.31	14.20	21.10	10.39	.46	545.
13.000	13.69	11.76	.3677	-2.19	13.45	20.38	9.78	.46	540.
14.000	11.20	9.97	.3645	-2.29	10.91	16.93	7.88	.43	540.
15.000	8.30	8.23	.3456	-1.64	8.40	13.13	6.10	.37	538.
16.000	5.49	6.35	.3344	-1.49	6.02	9.49	4.33	.44	536.
17.000	2.21	4.80	.2870	-1.58	4.31	6.27	3.10	.74	529.
18.000	-1.17	3.68	.2369	-1.16	3.42	4.63	2.54	.68	528.
19.000	-3.84	3.21	.1787	-.67	2.59	5.04	2.60	.68	519.
20.000	-5.83	2.83	.2183	-.42	2.16	6.36	2.53	.40	514.
21.000	-7.62	2.92	.2693	-.13	2.06	7.98	2.67	.17	513.
22.000	-8.98	2.75	.2474	.02	1.74	9.18	2.64	.13	500.
23.000	-10.18	2.65	.2273	-.01	1.66	10.32	2.60	.07	485.
24.000	-11.25	2.75	.1018	-.07	1.67	11.38	2.72	.05	485.
25.000	-12.15	2.64	.0277	-.20	1.61	12.26	2.62	-.06	477.
26.000	-13.00	2.67	-.0335	-.30	1.59	13.10	2.66	.15	443.
27.000	-13.81	2.97	-.0012	-.36	1.91	13.94	2.97	.23	437.
28.000	-14.78	2.86	-.0371	-.13	1.66	14.87	2.87	.13	386.
29.000	-15.65	3.26	-.0849	.05	2.15	15.79	3.26	-.07	336.
30.000	-16.66	3.06	-.1483	.21	1.66	16.74	3.03	-.11	230.
32.000	-19.78	3.11	.0288	1.13	2.25	19.94	3.07	-.77	119.
34.000	-21.65	3.34	.0163	1.17	2.48	21.82	3.33	-.20	118.
36.000	-24.45	3.71	.0853	.42	2.88	24.63	3.68	-.20	119.
38.000	-27.80	4.21	.2056	.09	3.62	28.03	4.19	.14	119.
40.000	-30.97	4.76	.2650	.80	3.58	31.19	4.68	-.03	120.
42.000	-34.83	5.35	.0447	1.49	3.97	35.09	5.29	.01	120.
44.000	-38.99	4.88	-.0104	3.03	4.67	39.40	4.74	-.14	120.
46.000	-41.71	5.92	.0973	5.17	4.74	42.32	5.76	.02	120.
48.000	-43.33	7.45	-.2197	6.26	5.25	44.07	7.53	-.05	121.
50.000	-45.57	7.88	-.1171	6.28	6.05	46.38	7.96	-.08	121.
52.000	-48.74	7.46	-.2025	5.12	6.65	49.45	7.45	-.13	117.
54.000	-51.97	8.25	-.0695	4.18	7.30	52.64	8.28	-.24	113.
56.000	-55.01	9.34	-.1328	4.57	7.31	55.67	9.37	.37	107.
58.000	-58.07	9.95	-.0697	2.60	9.05	58.84	9.84	.05	100.
60.000	-61.73	11.80	.1024	1.32	11.59	62.85	11.63	-.03	84.
62.000	-66.68	15.98	.0640	2.45	14.69	68.40	15.52	-.45	60.
64.000	-70.65	19.46	.2935	F 77	14.99	72.78	18.39	-.15	51.
66.000	-70.13	22.60	.2676	6.25	15.23	72.60	21.26	-.05	45.
68.000	-64.95	24.78	.1805	6.96	14.29	67.26	23.55	.06	38.
70.000	-56.19	19.99	-.0679	3.35	15.69	58.67	19.00	.01	24.

TABLE I-8. WIND STATISTICAL PARAMETERS

AUGUST

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	.27	2.37	.1481	.27	3.23	3.33	2.26	1.54	574.
1.000	2.58	4.97	.4184	-.52	4.55	6.30	3.55	.82	562.
2.000	4.61	5.15	.3132	.04	4.64	7.29	4.00	.68	564.
3.000	6.43	5.63	.3319	.40	5.07	8.75	4.71	.60	564.
4.000	7.74	5.81	.3064	.46	5.70	10.08	4.98	.57	566.
5.000	8.45	6.02	.2900	.84	6.09	10.83	5.30	.55	565.
6.000	8.93	6.31	.2832	1.35	6.47	11.47	5.57	.63	562.
7.000	9.73	7.05	.3335	1.63	7.31	12.72	6.19	.66	549.
8.000	10.71	7.68	.3498	2.00	8.49	14.17	6.98	.55	545.
9.000	11.76	8.59	.3775	2.28	10.23	15.91	8.28	.57	546.
10.000	12.70	9.68	.3698	2.22	12.18	17.75	9.64	.63	544.
11.000	13.75	10.62	.3334	2.00	13.60	19.43	10.62	.61	540.
12.000	14.73	10.99	.3815	1.24	13.49	20.32	10.39	.45	539.
13.000	14.47	10.59	.3829	.31	12.29	19.61	9.38	.33	532.
14.000	12.31	8.85	.3387	-.14	9.87	16.41	7.60	.35	533.
15.000	9.90	7.26	.3176	-.11	7.47	12.96	6.19	.42	528.
16.000	7.03	5.83	.3205	-.19	5.54	9.41	5.04	.63	523.
17.000	3.85	5.00	.2685	-.51	4.32	6.60	3.90	.99	520.
18.000	.54	3.93	.1079	-.52	3.37	4.59	2.50	.99	521.
19.000	-2.04	3.39	.1333	-.39	2.53	4.25	2.04	.62	521.
20.000	-4.14	3.14	.0739	-.24	2.14	5.15	2.26	.37	517.
21.000	-5.91	2.97	.0501	-.28	2.06	6.44	2.57	.26	514.
22.000	-7.23	2.77	.2255	-.17	1.71	7.50	2.61	-.23	506.
23.000	-8.39	2.84	.2443	-.09	1.61	8.58	2.73	-.26	496.
24.000	-9.47	2.98	.1010	.02	1.73	9.65	2.89	-.17	493.
25.000	-10.35	2.91	.0438	.02	1.68	10.50	2.86	-.15	484.
26.000	-11.08	2.91	.0525	-.05	1.71	11.22	2.88	-.15	453.
27.000	-11.94	3.18	.0098	-.26	2.04	12.13	3.13	-.05	441.
28.000	-12.73	3.13	-.0071	-.16	1.72	12.85	3.10	-.25	401.
29.000	-13.58	3.60	-.0153	-.10	2.10	13.75	3.57	-.22	342.
30.000	-13.94	3.66	-.0494	.00	1.69	14.04	3.64	-.09	254.
32.000	-16.83	3.89	.0037	1.48	2.27	17.05	3.87	.19	138.
34.000	-18.21	4.64	.0805	.80	2.63	18.43	4.61	.24	134.
36.000	-19.44	5.44	.0121	.84	3.26	19.73	5.42	.23	132.
38.000	-21.48	5.32	-.0117	.93	3.59	21.81	5.25	-.16	134.
40.000	-24.52	5.99	.0143	1.10	3.62	24.84	5.85	-.47	135.
42.000	-27.52	7.12	.0093	.84	4.18	27.89	6.95	.11	138.
44.000	-30.74	8.01	-.1400	2.96	5.00	31.29	8.00	.11	139.
46.000	-32.84	9.29	.0123	5.79	5.32	33.85	8.98	.31	138.
48.000	-33.47	9.43	.0351	7.51	5.44	34.82	9.06	.32	136.
50.000	-33.01	10.38	-.1281	7.68	5.95	34.45	10.25	.06	134.
52.000	-34.53	11.15	-.1781	5.77	6.90	35.69	11.11	.25	130.
54.000	-36.22	11.69	-.1206	5.24	7.96	37.45	11.69	.21	127.
56.000	-36.69	14.92	-.1012	2.65	10.26	38.60	13.79	-.15	112.
58.000	-39.60	17.22	.1400	3.53	10.94	41.61	16.26	-.05	94.
60.000	-39.46	19.30	-.0227	4.91	12.11	42.24	17.70	.05	70.
62.000	-36.63	19.21	-.1396	4.75	13.55	39.53	18.73	.21	62.
64.000	-35.90	20.33	-.2311	2.54	12.94	38.68	19.39	.59	56.
66.000	-30.90	19.08	-.1119	1.66	16.33	36.29	16.24	1.76	48.
68.000	-23.85	20.62	-.0345	1.47	11.88	28.31	18.17	1.89	42.
70.000	-13.40	21.66	-.3491	-3.95	15.29	23.44	18.30	1.25	27.

TABLE I-9. WIND STATISTICAL PARAMETERS

SEPTEMBER

S[illegible]ON = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	-.19	2.98	.0897	-.75	3.56	3.96	2.54	1.20	529.
1.000	1.53	6.21	.2654	-.93	5.92	7.42	4.64	1.24	526.
2.000	3.97	6.28	.1833	-.36	5.71	8.07	4.75	.97	528.
3.000	5.87	6.92	.2393	.07	5.96	9.43	5.37	.81	527.
4.000	7.54	7.50	.2723	.39	6.65	10.91	6.20	.92	528.
5.000	9.02	8.00	.2826	.69	7.02	12.20	6.79	1.10	528.
6.000	10.36	8.57	.2920	.90	7.46	13.52	7.38	1.08	528.
7.000	11.74	9.10	.3334	1.15	8.60	15.15	8.13	.98	528.
8.000	13.09	9.72	.3482	1.42	9.81	16.88	8.89	.87	523.
9.000	14.53	10.66	.3346	1.90	11.07	18.84	9.78	.75	520.
10.000	16.02	11.53	.2921	2.05	12.14	20.99	10.00	.44	516.
11.000	17.54	12.41	.2461	1.69	13.44	23.10	10.54	.24	513.
12.000	18.78	12.84	.2451	.79	13.53	24.01	11.15	.26	513.
13.000	18.72	12.15	.2778	-.09	12.55	23.25	10.69	.16	511.
14.000	16.42	10.51	.3244	-.26	10.42	20.16	9.05	.22	513.
15.000	14.03	9.03	.3547	-.43	8.20	18.82	7.91	.40	509.
16.000	11.12	7.38	.3597	-.33	6.31	13.28	6.45	.41	509.
17.000	7.89	5.96	.3271	-.42	5.01	9.80	5.18	.68	507.
18.000	4.70	5.08	.3331	-.44	4.11	6.91	4.13	1.11	508.
19.000	2.48	4.44	.4261	-.23	3.23	5.03	3.31	1.30	502.
20.000	.89	3.97	.4076	-.21	2.68	4.16	2.54	1.38	495.
21.000	-.46	3.78	.3541	-.09	2.53	3.98	2.24	1.03	488.
22.000	-1.47	3.70	.2465	-.15	2.20	4.02	2.14	.81	487.
23.000	-2.16	3.78	.2171	-.11	2.06	4.20	2.36	1.07	471.
24.000	-2.76	3.99	.1831	-.08	2.12	4.59	2.64	1.32	469.
25.000	-3.17	4.24	.2334	-.20	1.94	4.87	2.85	1.70	452.
26.000	-3.53	4.36	.2072	-.20	1.83	5.14	2.97	.97	411.
27.000	-3.84	4.52	.2130	-.08	2.03	5.41	3.15	.48	369.
28.000	-3.89	4.42	.1496	-.02	1.78	5.32	3.09	.55	356.
29.000	-3.80	4.55	.1054	.02	2.29	5.53	3.12	.58	260.
30.000	-3.63	4.60	.1616	.11	2.10	5.41	3.06	.61	238.
32.000	-5.01	4.97	.0676	1.38	2.82	6.85	3.54	.41	119.
34.000	-4.42	5.17	-.0676	1.26	2.90	6.56	3.53	.49	117.
36.000	-5.10	5.46	.0622	.68	2.97	7.05	3.89	.48	117.
38.000	-6.16	6.14	.0570	.02	3.65	8.25	4.53	.54	117.
40.000	-7.41	7.36	-.0124	1.06	3.66	9.79	5.25	.54	117.
42.000	-8.61	7.62	-.0878	1.86	4.34	10.95	5.85	.44	116.
44.000	-8.83	9.02	.0292	3.12	4.98	12.21	6.64	.48	117.
46.000	-7.78	9.96	-.1524	4.61	5.24	12.45	7.26	.98	119.
48.000	-5.55	10.73	-.0589	4.91	5.35	12.28	6.86	.90	119.
50.000	-5.04	11.03	-.1977	4.88	6.20	12.43	7.35	.99	119.
52.000	-4.21	11.27	-.1824	5.65	7.45	13.47	7.04	1.18	113.
54.000	-2.75	12.23	-.0823	6.98	7.37	14.11	7.72	1.24	106.
56.000	-.02	12.32	-.0077	5.45	8.38	13.47	8.28	1.15	91.
58.000	1.02	14.28	.0580	4.40	8.03	15.32	7.15	.39	74.
60.000	3.86	16.93	.2952	2.43	8.03	17.07	8.72	.32	60.
62.000	3.70	18.83	.1962	.00	7.58	18.76	8.18	1.08	49.
64.000	7.53	18.61	-.1857	.46	10.19	20.00	9.94	-.05	42.
66.000	10.06	19.47	-.2537	.01	10.39	21.83	10.12	.08	41.
68.000	12.76	19.38	-.3744	-1.80	10.04	22.86	10.47	.07	36.
70.000	14.04	19.80	-.5767	-5.51	9.37	20.84	16.26	.97	25.

TABLE I-10. WIND STATISTICAL PARAMETERS

OCTOBER

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	-.34	3.15	.0559	-1.10	3.72	4.27	2.61	.96	558.
1.000	2.69	6.54	.1126	-.81	6.81	8.55	4.89	.96	553.
2.000	5.76	6.69	.0746	.24	6.65	9.67	5.35	.73	552.
3.000	8.29	8.12	.1140	.86	7.48	12.00	6.89	.54	551.
4.000	10.66	9.44	.1606	1.41	8.63	14.45	8.37	.56	552.
5.000	12.60	10.41	.2034	2.05	10.01	16.65	9.71	.65	552.
6.000	14.81	11.33	.2348	2.45	11.32	18.99	10.99	.70	552.
7.000	16.56	12.12	.2309	2.60	12.71	21.12	11.97	.67	546.
8.000	18.28	13.00	.2160	2.62	13.68	23.19	12.60	.52	539.
9.000	19.96	13.93	.2518	3.29	14.88	25.33	13.51	.53	534.
10.000	21.79	14.76	.2459	3.69	15.68	27.52	13.95	.34	527.
11.000	23.64	15.27	.2525	3.76	16.14	29.40	14.20	.20	524.
12.000	24.85	15.45	.2340	3.29	15.80	30.19	14.32	.22	523.
13.000	24.45	14.11	.2668	2.52	13.87	28.77	12.94	.16	513.
14.000	22.18	12.06	.2921	2.28	11.16	25.34	11.19	.19	509.
15.000	19.17	9.89	.2996	2.00	8.98	21.56	9.20	.08	505.
16.000	16.04	8.37	.2448	1.56	7.48	17.96	7.94	.36	502.
17.000	12.71	6.90	.2207	1.19	6.07	14.28	6.60	.51	496.
18.000	9.59	5.97	.2632	.90	4.88	10.99	5.60	.78	492.
19.000	7.09	5.08	.3041	.55	3.69	8.36	4.48	.98	492.
20.000	5.42	4.67	.3168	.36	3.33	6.89	3.86	1.08	486.
21.000	4.46	4.62	.3479	.05	3.15	6.15	3.66	1.13	477.
22.000	3.92	4.84	.3849	-.10	2.99	5.84	3.69	1.29	478.
23.000	3.71	4.81	.3463	-.25	2.73	5.62	3.58	.98	468.
24.000	3.54	5.41	.2568	-.38	2.92	5.99	3.80	1.02	467.
25.000	3.67	5.73	.2028	-.37	2.87	6.28	3.90	1.00	460.
26.000	4.13	6.33	.2059	-.28	2.99	6.85	4.36	1.21	429.
27.000	4.76	7.08	.2672	-.17	3.32	7.65	5.02	1.32	376.
28.000	5.82	7.72	.3559	.10	3.34	8.48	5.72	1.38	375.
29.000	6.40	8.21	.3379	-.01	3.44	8.99	6.26	1.50	255.
30.000	7.56	8.66	.3055	.24	3.30	9.92	6.68	1.20	242.
32.000	12.74	12.49	.2142	3.90	5.26	15.51	10.95	.73	122.
34.000	17.59	14.37	.2508	4.14	6.00	19.48	13.76	.58	121.
36.000	21.10	16.17	.1524	2.43	5.75	22.54	15.40	.63	121.
38.000	23.30	16.30	.1397	2.68	5.67	24.69	15.41	.72	121.
40.000	26.41	17.66	.2597	3.40	6.02	27.69	17.03	.75	121.
42.000	29.80	18.19	.3011	5.77	7.16	31.76	17.15	.38	123.
44.000	35.20	18.74	.3932	6.14	7.03	36.88	17.79	.19	121.
46.000	40.09	20.99	.4510	7.72	7.41	41.65	20.66	.01	121.
48.000	43.47	22.05	.3818	8.28	7.88	45.13	21.65	.06	120.
50.000	47.35	23.22	.3424	8.15	8.88	48.93	23.05	.08	122.
52.000	50.83	23.95	.3028	7.27	8.66	52.24	23.55	.11	117.
54.000	54.13	23.28	.1201	6.96	9.19	55.40	23.13	-.10	113.
56.000	55.14	22.29	.2080	7.23	9.57	56.45	22.23	-.18	103.
58.000	55.30	24.66	.1521	6.19	10.32	56.88	23.97	-.22	91.
60.000	52.71	22.92	.0877	6.87	11.07	54.56	22.23	-.19	66.
62.000	50.51	21.38	.0167	8.31	9.87	52.20	21.16	-.12	49.
64.000	47.05	21.06	.1142	10.84	12.87	49.91	21.10	-.19	43.
66.000	44.39	19.68	-.0006	10.51	12.74	47.42	19.42	-.24	38.
68.000	45.67	20.34	-.2493	7.48	15.35	49.38	18.55	-.07	32.
70.000	48.62	20.98	-.1009	-.53	21.02	52.71	21.22	.19	24.

TABLE I-11. WIND STATISTICAL PARAMETERS

NOVEMBER

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	1.31	3.25	-.0557	-.75	3.60	4.36	2.61	.89	528.
1.000	5.72	6.83	.1117	-1.00	7.70	10.31	5.75	.89	527.
2.000	8.90	6.79	.0850	.30	7.92	12.44	5.75	.71	529.
3.000	12.41	8.09	.1013	1.12	9.22	15.85	7.37	.46	528.
4.000	15.77	9.60	.1009	1.63	10.53	19.32	8.99	.37	530.
5.000	18.66	11.41	.1131	1.68	12.16	22.62	10.82	.55	529.
6.000	21.37	12.97	.1257	1.68	13.94	25.82	12.44	.56	525.
7.000	23.98	14.44	.1435	1.59	15.37	28.83	13.81	.47	520.
8.000	26.20	15.37	.1308	1.37	16.79	31.51	14.61	.41	506.
9.000	28.32	16.59	.1343	1.06	17.79	33.90	15.66	.42	492.
10.000	30.44	17.07	.1184	.52	18.64	36.16	16.04	.44	482.
11.000	31.46	16.36	.1136	-.42	17.52	36.47	15.28	.42	458.
12.000	31.73	15.26	.1337	-.89	16.77	36.13	14.69	.52	451.
13.000	30.09	13.43	.1642	-.39	14.60	33.58	13.08	.60	444.
14.000	27.58	11.51	.1905	.20	12.22	30.27	11.20	.49	438.
15.000	24.45	9.85	.1883	.70	10.42	26.66	9.64	.32	434.
16.000	21.11	8.54	.1449	.77	8.88	22.97	8.39	.30	432.
17.000	17.60	7.71	.0925	.66	7.38	19.14	7.60	.35	430.
18.000	13.98	7.21	.0769	.59	5.97	15.38	6.83	.40	431.
19.000	11.29	6.79	.1387	.75	4.82	12.52	6.37	.54	430.
20.000	9.96	6.64	.2549	.71	4.09	11.08	6.13	.76	430.
21.000	9.14	6.85	.3494	.49	3.75	10.31	6.20	.90	439.
22.000	8.83	7.46	.4000	.34	3.95	10.26	6.62	1.03	433.
23.000	9.34	8.08	.5423	.51	3.75	10.67	7.29	1.10	426.
24.000	9.90	9.06	.5539	.58	4.20	11.52	8.09	1.16	415.
25.000	10.90	10.34	.3816	.51	4.80	12.71	9.34	1.36	401.
26.000	12.29	11.46	.6004	.58	5.02	14.26	10.21	1.27	382.
27.000	13.68	12.22	.5523	.55	5.19	15.59	10.98	1.20	347.
28.000	15.73	13.34	.4828	.74	5.66	17.70	12.02	1.04	345.
29.000	18.97	14.76	.5244	1.13	6.10	20.81	13.53	.92	233.
30.000	21.97	15.77	.5581	1.40	6.51	23.54	14.87	.75	226.
32.000	27.97	17.26	.5204	2.16	6.62	28.99	16.97	1.07	119.
34.000	33.55	17.52	.3593	1.79	6.84	34.39	17.31	.78	119.
36.000	40.17	18.12	.3359	1.51	7.52	40.93	18.03	.79	120.
38.000	44.83	17.53	.4220	1.95	7.82	45.60	17.39	.56	121.
40.000	50.19	16.90	.5776	5.44	8.78	51.21	17.00	.26	121.
42.000	57.3	17.71	.5561	8.53	10.36	58.76	18.06	-.07	121.
44.000	65.69	18.24	.6417	12.08	11.03	67.45	19.13	-.03	121.
46.000	73.69	19.90	.6227	12.99	12.93	75.63	21.01	-.02	123.
48.000	80.12	21.47	.5653	13.23	12.93	81.98	22.40	-.12	122.
50.000	85.57	22.29	.6080	14.07	11.86	87.29	23.19	-.08	121.
52.000	89.24	23.03	.5737	14.23	12.57	91.04	23.77	-.18	120.
54.000	90.95	24.76	.4899	14.07	13.19	92.84	25.22	-.26	115.
56.000	91.69	25.57	.3622	13.24	13.45	93.55	25.76	-.26	112.
58.000	89.99	26.90	.3509	11.88	13.74	91.70	27.22	.19	93.
60.000	83.83	26.35	.1644	7.85	14.49	85.49	26.11	.17	75.
62.000	77.21	27.22	-.0272	4.78	18.07	79.41	27.19	.35	51.
64.000	69.82	22.71	-.0905	7.29	19.98	72.93	22.70	.03	43.
66.000	66.97	20.24	-.1624	8.94	21.09	70.89	19.52	-.38	36.
68.000	68.09	25.67	-.2417	12.00	21.79	73.15	23.33	-.16	33.
70.000	59.76	34.22	-.3273	16.41	24.91	67.96	31.30	.19	24.

TABLE I-12. WIND STATISTICAL PARAMETERS

DECEMBER

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	1.55	3.46	-.1500	-1.05	4.05	4.79	2.99	1.08	518.
1.000	7.21	7.25	.0682	-.68	9.22	12.06	6.71	.71	510.
2.000	11.50	6.33	.0544	.24	9.02	14.71	6.10	.48	513.
3.000	15.88	7.19	.0609	.97	10.08	18.91	6.96	.23	513.
4.000	20.00	8.55	.0816	1.11	11.62	23.17	8.48	.46	516.
5.000	23.25	10.06	.0793	1.36	13.19	26.76	10.08	.61	513.
6.000	26.73	11.78	.0736	1.47	14.79	30.62	11.67	.53	512.
7.000	30.21	13.40	.0555	1.70	16.77	34.64	13.27	.44	507.
8.000	33.16	14.50	.0635	1.19	18.29	37.98	14.26	.44	492.
9.000	36.03	15.27	.0554	.52	19.02	40.87	14.90	.39	472.
10.000	38.59	15.84	.0756	.54	19.58	43.40	15.49	.39	452.
11.000	39.92	15.60	.1033	-.38	18.95	44.31	15.25	.34	427.
12.000	39.97	14.52	.0406	-1.46	17.36	43.61	14.48	.37	416.
13.000	36.98	12.44	.0497	-1.48	14.40	39.75	12.32	.35	404.
14.000	33.00	11.12	.0847	-.93	12.59	35.35	11.06	.45	397.
15.000	28.65	9.43	.1365	-.04	10.77	30.62	9.36	.20	386.
16.000	25.33	8.76	.1782	.13	9.03	26.93	8.62	.20	382.
17.000	21.72	8.23	.1639	.16	7.35	22.98	8.10	.13	363.
18.000	17.87	8.04	.1695	.30	6.31	19.00	7.92	.33	365.
19.000	14.19	7.28	.2400	.29	5.37	15.23	7.16	.79	372.
20.000	11.77	7.12	.2807	.06	4.64	12.82	6.79	1.02	378.
21.000	10.22	7.13	.3281	-.02	4.35	11.40	6.64	.93	373.
22.000	9.71	7.80	.4049	.05	4.44	11.09	7.19	1.12	367.
23.000	9.49	8.41	.5183	-.17	4.29	11.04	7.57	1.24	360.
24.000	9.58	9.85	.5424	-.41	4.67	11.75	8.53	1.43	358.
25.000	9.96	11.25	.4867	-.33	5.17	12.67	9.59	1.70	340.
26.000	11.38	12.52	.4942	-.10	5.58	14.17	10.79	1.52	336.
27.000	13.59	13.00	.5076	.19	6.20	16.19	11.39	1.08	302.
28.000	15.54	14.63	.4923	.36	6.78	18.35	12.83	.97	296.
29.000	19.43	15.48	.5574	.97	7.29	21.76	14.04	.79	208.
30.000	23.09	16.44	.5176	1.55	7.65	25.25	15.05	.73	194.
32.000	36.80	16.95	.3753	6.61	8.71	38.68	16.23	.05	82.
34.000	46.56	18.46	.3578	8.20	10.15	48.44	18.19	.06	82.
36.000	55.38	18.10	.4482	6.89	9.81	56.68	18.02	-.18	84.
38.000	61.22	17.81	.4237	6.36	10.51	62.40	17.89	-.23	84.
40.000	67.28	17.12	.2901	8.30	12.32	68.76	17.64	-.33	84.
42.000	72.90	17.27	.1470	11.60	13.63	74.92	17.86	-.38	84.
44.000	79.27	18.30	.1324	14.31	14.92	81.80	18.79	-.27	84.
46.000	83.82	19.82	.1454	16.67	15.56	86.89	19.63	-.46	84.
48.000	84.88	22.47	.0928	17.95	16.65	88.46	21.88	-.73	82.
50.000	88.70	24.70	.1553	18.13	15.54	92.12	23.63	-.63	81.
52.000	90.83	27.55	.0497	16.12	16.58	94.18	25.84	-.46	77.
54.000	91.75	27.79	-.0651	15.05	17.17	95.01	26.07	-.34	76.
56.000	91.91	28.59	-.0641	12.12	18.34	94.93	27.03	-.38	74.
58.000	90.93	30.05	-.0422	9.74	19.43	93.77	29.03	-.48	61.
60.000	91.60	26.67	-.0588	9.73	20.98	94.83	25.18	-.32	52.
62.000	87.67	25.50	.0252	16.03	20.42	91.64	24.50	-.42	39.
64.000	86.51	25.87	.1109	15.72	21.61	90.88	24.43	-.39	35.
66.000	79.23	29.80	.3469	14.36	20.65	83.13	29.52	-.02	30.
68.000	73.25	33.42	.3546	10.48	22.61	77.16	33.62	.34	25.
70.000	74.71	32.94	.3352	4.94	23.19	78.71	31.58	.16	17.

TABLE I-13. WIND STATISTICAL PARAMETERS

ANNUAL

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.003	.69	3.32	-.0032	-.51	3.82	4.34	2.74	1.12	6306.
1.000	4.62	6.87	.1429	-.97	7.10	9.33	5.73	1.05	6248.
2.000	7.69	6.92	.1116	-.30	7.15	11.03	6.05	.74	6273.
3.000	10.74	8.23	.1329	.19	8.02	13.81	7.54	.57	6269.
4.000	13.50	9.80	.1400	.43	9.07	16.57	9.29	.61	6286.
5.000	15.77	11.42	.1384	.64	10.23	19.02	11.06	.74	6277.
6.000	17.96	13.05	.1379	.80	11.48	21.48	12.81	.80	6262.
7.000	20.01	14.61	.1438	.90	12.85	23.93	14.38	.81	6197.
8.000	21.77	15.85	.1273	.89	14.20	26.20	15.55	.76	6083.
9.000	23.57	17.09	.1269	.92	15.36	28.44	16.61	.74	5974.
10.000	24.97	17.68	.1168	.66	16.13	30.20	16.88	.66	5827.
11.000	25.74	17.55	.1138	.03	16.27	31.12	16.37	.58	5651.
12.000	26.16	17.03	.1228	-.78	15.65	31.22	15.68	.53	5589.
13.000	24.71	15.26	.1669	-1.05	13.63	28.98	13.80	.47	5506.
14.000	22.02	13.52	.1935	-.76	11.06	25.33	12.20	.51	5461.
15.000	19.02	11.98	.2074	-.51	9.08	21.67	10.89	.55	5416.
16.000	15.90	10.84	.2006	-.51	7.48	18.11	9.93	.59	5391.
17.000	12.43	9.99	.1916	-.59	6.07	14.50	9.02	.74	5322.
18.000	8.94	9.38	.1699	-.57	5.06	11.39	8.01	1.00	5314.
19.000	6.08	8.76	.1751	-.41	4.15	9.21	6.80	1.29	5295.
20.000	4.01	8.44	.1764	-.35	3.54	8.11	5.86	1.56	5258.
21.000	2.43	8.47	.1704	-.30	3.23	7.70	5.38	1.60	5214.
22.000	1.43	8.77	.1697	-.27	3.16	7.74	5.40	1.65	5172.
23.000	.89	9.18	.1987	-.26	3.00	7.95	5.58	1.65	5059.
24.000	.46	9.90	.2033	-.26	3.24	8.54	5.99	1.71	5028.
25.000	.24	10.61	.2414	-.23	3.40	9.09	6.46	1.86	4898.
26.000	.57	11.61	.2872	-.15	3.57	9.88	7.10	1.87	4646.
27.000	.67	12.72	.2987	-.06	3.89	10.90	7.65	1.69	4187.
28.000	1.54	13.90	.2907	.10	4.20	11.85	8.54	1.66	4039.
29.000	1.58	15.59	.3059	.29	4.42	13.25	9.48	1.63	2973.
30.000	3.81	17.00	.3300	.46	4.71	14.44	10.85	1.61	2633.
32.000	7.03	21.13	.3767	2.11	5.94	18.53	13.69	1.37	1524.
34.000	9.67	24.67	.3691	1.98	6.64	21.92	16.45	1.24	1512.
36.000	11.53	28.14	.3007	1.42	6.83	25.02	18.66	1.12	1513.
38.000	12.32	31.00	.2905	1.49	7.81	27.66	20.29	1.05	1517.
40.000	12.94	34.03	.3563	2.89	9.16	30.70	21.83	.91	1519.
42.000	13.81	37.42	.4049	4.56	10.65	34.31	23.44	.79	1526.
44.000	14.91	40.97	.4189	6.64	11.50	37.99	25.20	.73	1529.
46.000	16.41	44.16	.4000	8.26	11.75	41.12	27.11	.72	1531.
48.000	17.30	46.31	.3695	8.99	12.05	43.10	28.51	.71	1525.
50.000	18.08	48.48	.3751	9.11	11.82	44.85	29.82	.72	1510.
52.000	17.76	50.33	.3552	8.87	12.21	46.56	30.16	.73	1467.
54.000	17.28	51.94	.3399	9.03	12.62	48.11	30.39	.71	1409.
56.000	17.75	53.83	.3260	8.49	13.12	50.11	30.76	.63	1303.
58.000	15.90	55.02	.3102	7.58	13.28	51.00	30.24	.61	1150.
60.000	14.09	56.33	.2881	6.90	13.48	52.00	29.96	.50	924.
62.000	11.68	56.35	.2465	6.13	13.95	51.53	29.85	.48	696.
64.000	11.15	56.39	.1163	5.60	14.32	51.52	29.81	.42	585.
66.000	9.25	55.53	-.0080	4.38	15.75	50.87	29.18	.46	501.
68.000	9.68	54.11	-.0420	2.33	16.17	49.38	29.25	.59	421.
70.000	10.48	51.17	-.0698	-.15	18.25	47.00	29.40	.67	300.

TABLE II-1. THERMODYNAMIC STATISTICAL PARAMETERS

JANUARY

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1019.4000	9.1320	-.58	273.75	5.56	-.09	1295.0000	33.6700	.05	516.	516.	516.
.003	1019.0000	9.1409	-.59	273.74	5.55	-.09	1295.0000	33.6300	.05	517.	517.	517.
1.000	900.2500	7.9086	-.71	272.89	7.83	-.12	1148.0000	34.0000	.10	517.	517.	517.
2.000	794.1400	8.0795	-.68	270.37	7.05	-.53	1022.0000	23.3200	.34	517.	517.	517.
3.000	699.5500	8.6558	-.66	266.70	6.45	-.72	913.2000	16.1800	.40	517.	517.	517.
4.000	614.8000	9.1540	-.67	261.68	6.25	-.82	818.1000	12.2000	.28	517.	517.	517.
5.000	538.9200	9.5122	-.72	255.81	6.07	-.87	733.7000	9.4900	-.02	517.	517.	517.
6.000	471.0100	9.6329	-.75	249.27	6.07	-.81	658.2000	7.9560	-.35	516.	516.	516.
7.000	410.0100	9.5092	-.78	242.51	5.68	-.63	588.9000	7.0220	-.61	516.	516.	516.
8.000	355.6700	9.2510	-.75	235.62	5.07	-.43	525.8000	7.7410	-.93	514.	514.	514.
9.000	307.1800	8.6694	-.69	228.96	4.20	-.31	467.4000	10.0400	-1.26	513.	513.	513.
10.000	264.1600	7.7060	-.59	223.03	3.67	-.02	412.7000	12.8800	-1.19	513.	513.	513.
11.000	226.4600	6.5188	-.50	218.58	4.71	.58	361.2000	15.0800	-.81	512.	512.	512.
12.000	193.7100	5.2741	-.44	216.59	5.90	.15	311.9000	14.9700	-.26	502.	502.	502.
13.000	165.5100	4.1405	-.45	216.12	5.22	-.24	267.0000	11.6000	-.06	499.	499.	499.
14.000	141.3300	3.2861	-.45	214.96	4.10	.01	229.2000	8.5250	-.25	494.	494.	494.
15.000	120.5700	2.5054	-.54	213.03	3.84	.00	197.3000	6.9350	-.27	486.	486.	486.
16.000	102.7300	2.0278	-.59	211.30	3.82	.03	169.5000	5.6940	-.32	482.	482.	482.
17.000	87.4320	1.5988	-.58	210.42	3.88	.03	144.8000	4.6660	-.31	464.	464.	464.
18.000	74.3910	1.2564	-.59	210.36	3.70	.00	123.2000	3.5950	-.42	456.	456.	456.
19.000	63.3250	1.0067	-.58	211.06	3.31	.32	104.6000	2.6760	-.55	445.	445.	445.
20.000	53.9410	.8176	-.55	212.14	3.25	.53	88.6100	2.0670	-.80	438.	438.	438.
21.000	46.0040	.6803	-.46	213.24	3.47	1.02	75.1800	1.6890	-1.04	421.	421.	421.
22.000	39.2550	.5802	-.30	214.23	3.74	1.24	63.8500	1.3860	-1.18	417.	417.	417.
23.000	33.5320	.5108	-.11	215.36	3.98	1.16	54.2600	1.1380	-1.21	411.	411.	411.
24.000	28.6480	.4667	-.02	216.37	4.15	.94	46.1400	.9210	-.98	419.	419.	419.
25.000	24.5030	.4313	.06	217.32	4.26	.84	39.2900	.7464	-.73	406.	406.	406.
26.000	20.9830	.3985	.15	218.42	4.19	.59	33.4700	.6111	-.44	394.	394.	394.
27.000	17.9770	.3600	.23	219.34	4.13	.48	28.5600	.5214	-.31	361.	361.	361.
28.000	15.4120	.3360	.29	220.62	4.26	.45	24.3400	.4691	.04	336.	336.	336.
29.000	13.2380	.3081	.27	222.21	4.43	.48	20.7600	.4408	.11	303.	303.	303.
30.000	11.3820	.2880	.20	223.99	4.71	.30	17.7100	.4266	.01	266.	266.	266.
32.000	8.4212	.2618	-.35	229.74	6.07	.05	12.7900	.4185	.51	111.	120.	100.
34.000	6.3030	.2111	-.31	235.07	6.91	-.02	9.3630	.3546	.11	107.	117.	105.
36.000	4.7431	.1719	-.05	241.00	6.95	.26	6.8780	.2580	-.59	107.	117.	106.
38.000	3.5977	.1382	.12	247.81	7.66	.22	5.0660	.2242	-.71	106.	117.	106.
40.000	2.7496	.1118	.26	254.60	8.82	.39	3.7670	.1708	-.59	106.	117.	105.
42.000	2.1170	.0914	.32	261.48	9.22	.39	2.8240	.1304	-.36	106.	117.	106.
44.000	1.6398	.0756	.25	266.31	8.98	.27	2.1450	.0995	-.09	106.	113.	106.
46.000	1.2753	.0625	.18	268.43	7.25	-.04	1.6540	.0759	.16	106.	111.	106.
48.000	.9934	.0508	.08	267.99	6.11	.13	1.2630	.0619	.36	105.	111.	105.
50.000	.7722	.0409	.01	264.77	4.56	.45	1.0140	.0499	.23	105.	112.	105.
52.000	.5983	.0317	.05	261.34	5.90	.68	.7956	.0394	.25	101.	106.	101.
54.000	.4626	.0255	.02	258.98	6.69	.47	.6219	.0330	.17	98.	109.	98.
56.000	.3558	.0200	-.02	255.73	6.97	.21	.4845	.0262	.09	91.	102.	91.
58.000	.2735	.0166	.03	253.06	7.54	.44	.3761	.0210	.13	79.	90.	79.
60.000	.2074	.0137	.35	249.52	8.37	.77	.2894	.0173	.24	60.	70.	60.
62.000	.1548	.0094	.93	244.57	7.77	1.12	.2199	.0117	.54	44.	53.	44.
64.000	.1170	.0078	1.21	239.43	9.01	1.43	.1702	.0096	.68	39.	48.	39.
66.000	.0882	.0056	1.12	235.02	9.80	1.37	.1310	.0078	.65	34.	42.	34.
68.000	.0663	.0050	1.09	228.60	10.40	1.12	.1010	.0067	.65	27.	34.	27.
70.000	.0490	.0043	.78	220.08	8.78	-.05	.0773	.0060	.50	13.	24.	13.

TABLE II-2. THERMODYNAMIC STATISTICAL PARAMETERS

FEBRUARY

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1017.9000	9.1182	-.25	273.74	5.33	.03	1293.0000	32.8200	.13	482.	482.	482.
.003	1017.5000	9.1191	-.25	273.73	5.32	.03	1293.0000	32.7900	.13	482.	482.	482.
1.000	898.7700	7.7353	-.36	272.13	7.46	.00	1150.0000	32.8400	.07	482.	482.	482.
2.000	792.3800	7.7135	-.32	269.08	6.55	-.26	1025.0000	21.9800	.10	482.	482.	482.
3.000	697.5100	8.1841	-.32	265.08	6.24	-.46	916.1000	16.2600	.27	482.	482.	482.
4.000	612.5400	8.5855	-.35	259.98	5.86	-.48	820.5000	11.9100	.16	482.	482.	482.
5.000	536.4200	8.9296	-.41	253.92	5.91	-.50	735.8000	9.8180	.04	482.	482.	482.
6.000	468.3700	9.0228	-.42	247.52	5.77	-.37	659.1000	8.2620	-.22	482.	482.	482.
7.000	407.3300	8.8894	-.41	240.82	5.52	-.12	589.2000	7.9490	-.42	482.	482.	482.
8.000	352.9700	8.6078	-.34	234.08	5.07	.15	525.3000	8.8180	-.92	479.	479.	479.
9.000	304.5700	8.0461	-.21	227.68	4.66	.31	466.1000	10.7500	-1.18	479.	479.	479.
10.000	261.7600	7.1471	-.03	222.35	4.65	.51	410.3000	13.3200	-1.00	478.	478.	478.
11.000	224.4000	6.0374	.14	219.22	5.52	.48	356.9000	15.0600	-.40	478.	478.	478.
12.000	192.1000	4.8472	.28	218.46	6.06	-.22	306.7000	14.0600	.26	474.	474.	474.
13.000	164.3500	3.8026	.33	218.14	5.06	-.74	262.7000	10.7500	.58	469.	469.	469.
14.000	140.5400	2.9924	.34	216.77	3.94	-.41	226.0000	7.9380	.34	464.	464.	464.
15.000	120.0700	2.3692	.37	214.85	3.80	.02	194.8000	6.5660	.25	460.	460.	460.
16.000	102.4500	1.8370	.35	213.02	3.78	.08	167.6000	5.3540	.27	458.	458.	458.
17.000	87.3130	1.4145	.32	212.07	3.74	.02	143.5000	4.2810	.39	449.	449.	449.
18.000	74.3950	1.0852	.24	212.07	3.58	-.12	122.3000	3.3000	.56	443.	443.	443.
19.000	63.4060	.8747	.11	212.64	3.36	.12	103.9000	2.4160	.40	438.	438.	438.
20.000	54.0640	.7244	.00	213.30	3.03	.16	88.3200	1.7890	.32	434.	434.	434.
21.000	46.1210	.6233	-.04	213.99	2.92	.24	75.1000	1.3470	.17	412.	412.	412.
22.000	39.3740	.5492	-.03	214.85	3.00	.11	63.8500	1.0650	.14	407.	407.	407.
23.000	33.6390	.4932	.02	215.67	2.93	-.07	54.3400	.8573	.00	398.	398.	398.
24.000	28.7650	.4499	.04	216.75	2.96	-.02	46.2400	.6970	-.19	401.	401.	401.
25.000	24.6110	.4045	.03	217.73	3.03	-.23	39.3800	.5735	-.24	393.	393.	393.
26.000	21.0780	.3714	.05	218.87	3.18	-.08	33.5500	.5122	-.47	386.	386.	386.
27.000	18.0540	.3421	.10	219.97	3.27	.04	28.5900	.4595	-.41	357.	357.	357.
28.000	15.4840	.3156	.07	221.30	3.43	-.10	24.3800	.4338	-.20	330.	330.	330.
29.000	13.2950	.2795	.09	223.06	3.74	.21	20.7700	.4151	-.31	296.	296.	296.
30.000	11.4340	.2540	-.04	224.97	3.92	.52	17.7100	.3910	-.33	261.	261.	261.
32.000	8.4963	.2332	-.38	232.98	6.13	.70	12.7500	.3721	.02	78.	94.	72.
34.000	6.3901	.1947	-.22	238.90	6.78	.73	9.3290	.3042	-.15	76.	92.	74.
36.000	4.8308	.1640	.02	245.08	8.17	.19	6.8800	.2506	-.52	74.	90.	74.
38.000	3.6783	.1383	.22	251.20	8.60	-.24	5.1150	.2011	-.53	74.	90.	74.
40.000	2.8182	.1174	.27	257.03	9.47	-.41	3.8330	.1567	-.42	74.	88.	74.
42.000	2.1712	.1013	.23	260.96	9.58	-.47	2.9050	.1152	-.18	74.	89.	74.
44.000	1.6785	.0878	.13	263.46	8.85	-.55	2.2210	.0958	.27	74.	88.	74.
46.000	1.3005	.0737	.10	264.94	6.71	-.26	1.7080	.0826	.18	73.	87.	73.
48.000	1.0094	.0605	.06	264.49	5.99	.65	1.3260	.0713	.02	72.	09.	72.
50.000	.7820	.0498	.08	262.57	6.51	.79	1.0340	.0658	-.16	70.	85.	70.
52.000	.6052	.0384	.22	260.37	8.04	.29	.8077	.0544	-.06	69.	86.	69.
54.000	.4664	.0300	.38	257.88	7.86	.04	.6296	.0454	.06	66.	82.	66.
56.000	.3587	.0213	.13	256.62	8.42	.49	.4862	.0342	.04	64.	81.	64.
58.000	.2768	.0165	.29	254.39	9.22	.34	.3788	.0251	.51	53.	71.	53.
60.000	.2128	.0135	.14	252.29	9.87	.16	.2934	.0208	.61	47.	63.	47.
62.000	.1612	.0100	.18	248.08	9.76	.00	.2269	.0173	.42	34.	50.	34.
64.000	.1233	.0073	.39	243.30	10.12	.35	.1774	.0127	.41	28.	43.	28.
66.000	.0928	.0055	.30	237.47	11.29	.75	.1378	.0099	.21	22.	35.	22.
68.000	.0688	.0043	.37	229.96	11.35	.81	.1060	.0064	.34	19.	30.	19.
70.000	.0516	.0036	.11	223.45	9.18	.05	.0812	.0049	.23	12.	21.	12.

TABLE II-3. THERMODYNAMIC STATISTICAL PARAMETERS

MARCH

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1017.6000	8.9947	-.44	277.66	4.31	-.02	1274.0000	26.7600	.09	527.	527.	527.
.003	1017.3000	9.0181	-.43	277.66	4.31	-.02	1273.0000	26.7300	.09	528.	528.	528.
1.000	900.3600	7.8557	-.59	276.28	7.26	-.12	1134.0000	31.2200	.13	528.	528.	528.
2.000	795.2700	7.7788	-.64	272.61	6.69	-.47	1015.0000	22.6000	.38	528.	528.	528.
3.000	701.1600	8.1030	-.64	268.15	6.06	-.71	910.1000	16.0100	.51	528.	528.	528.
4.000	616.5800	8.4783	-.68	262.70	5.88	-.81	817.2000	12.1700	.44	528.	528.	528.
5.000	540.7600	8.8346	-.69	256.54	5.74	-.78	734.1000	9.6120	.11	528.	528.	528.
6.000	472.8000	8.9299	-.73	249.93	5.67	-.65	658.9000	8.0080	-.30	527.	527.	527.
7.000	411.6800	8.7394	-.71	242.87	5.50	-.35	590.5000	7.1200	-.72	527.	527.	527.
8.000	357.2100	8.5842	-.67	235.80	5.00	-.11	527.7000	7.2920	-.99	527.	527.	527.
9.000	308.5100	8.1009	-.56	228.98	4.33	.04	469.4000	9.3320	-1.52	526.	526.	526.
10.000	265.3200	7.2305	-.42	223.10	3.85	.21	414.4000	12.4700	-1.27	525.	525.	525.
11.000	227.4800	6.0819	-.24	218.72	5.03	.65	362.6000	15.0300	-.84	524.	524.	524.
12.000	194.6500	4.8146	-.10	216.90	6.26	.25	313.0000	15.0100	-.27	520.	520.	520.
13.000	166.3800	3.6820	-.03	217.22	5.25	-.29	267.1000	11.1500	.11	516.	516.	516.
14.000	142.2100	2.8719	.02	216.40	4.09	-.24	229.1000	8.1190	.07	511.	511.	511.
15.000	121.4600	2.2310	.04	214.67	3.77	-.06	197.2000	6.4130	.04	508.	508.	508.
16.000	103.6300	1.7019	.04	213.20	3.76	-.05	169.4000	5.1680	.07	505.	505.	505.
17.000	88.3360	1.3243	.02	212.62	3.67	-.10	144.8000	4.0760	.10	499.	499.	499.
18.000	75.2890	1.0264	-.03	212.56	3.50	-.12	123.4000	3.1610	.10	494.	494.	494.
19.000	64.1850	.8224	-.09	213.01	3.12	-.16	105.0000	2.2990	.08	488.	488.	488.
20.000	54.7540	.6726	-.18	213.88	2.97	-.28	89.2000	1.7470	.01	487.	487.	487.
21.000	46.7400	.5795	-.23	214.87	2.99	-.12	75.7900	1.3520	-.24	468.	468.	468.
22.000	39.9310	.5105	-.26	215.86	3.11	.23	64.4500	1.0510	-.48	462.	462.	462.
23.000	34.1470	.4601	-.28	216.90	3.03	.28	54.8500	.8316	-.71	456.	456.	456.
24.000	29.2090	.4123	-.34	217.85	2.96	.12	46.7100	.6440	-.55	454.	454.	454.
25.000	25.0130	.3836	-.32	218.70	2.92	.00	39.8400	.5124	-.38	442.	442.	442.
26.000	21.4370	.3576	-.31	219.89	2.96	.02	33.9600	.4513	-.32	428.	428.	428.
27.000	18.3850	.3306	-.35	221.22	3.18	.16	28.9500	.4097	-.32	393.	393.	393.
28.000	15.7790	.3009	-.21	222.74	3.38	.53	24.6800	.3813	-.53	359.	359.	359.
29.000	13.5640	.2776	-.12	224.55	3.56	.56	21.0500	.3540	-.64	334.	334.	334.
30.000	11.6870	.2605	-.02	226.61	3.64	.56	17.9700	.3215	-.62	301.	301.	301.
32.000	8.7156	.2720	.94	233.02	4.83	1.11	13.0300	.3210	-.41	113.	119.	113.
34.000	6.5434	.2264	1.14	238.85	5.67	.54	9.5510	.2975	-.06	113.	119.	113.
36.000	4.9464	.1653	1.28	245.01	6.61	-.04	7.0430	.2673	.33	112.	118.	112.
38.000	3.7670	.1496	1.20	251.25	6.71	.16	5.2290	.2052	.90	112.	118.	112.
40.000	2.8871	.1216	1.02	256.26	6.59	.00	3.9290	.1622	1.02	112.	118.	112.
42.000	2.2246	.0977	.84	260.51	5.35	-.21	2.9730	.1295	1.24	112.	116.	112.
44.000	1.7215	.0774	.69	264.36	5.21	.09	2.2680	.1044	1.12	112.	116.	112.
46.000	1.3363	.0612	.57	266.58	5.38	.59	1.7430	.0799	.85	112.	111.	112.
48.000	1.0386	.0494	.50	267.36	5.44	.23	1.3520	.0640	.85	109.	110.	109.
50.000	.8080	.0397	.42	267.40	5.28	.10	1.0510	.0504	.64	104.	103.	104.
52.000	.6282	.0322	.40	266.39	5.05	-.24	.8203	.0394	.37	101.	103.	101.
54.000	.4881	.0259	.38	265.42	4.91	.06	.6403	.0323	.21	100.	104.	100.
56.000	.3787	.0212	.40	263.63	5.69	.34	.5009	.0253	.24	94.	99.	94.
58.000	.2924	.0159	.03	260.84	6.11	.53	.3909	.0198	.09	82.	88.	82.
60.000	.2251	.0123	.02	256.73	6.83	-.16	.3055	.0153	.19	65.	70.	65.
62.000	.1721	.0100	-.08	252.78	7.74	.23	.2371	.0124	-.30	51.	56.	51.
64.000	.1303	.0082	.09	246.21	7.40	.48	.1844	.0101	-.28	36.	41.	36.
66.000	.0974	.0056	.15	239.25	5.89	.39	.1418	.0087	-.18	29.	33.	29.
68.000	.0732	.0043	.13	233.09	7.52	1.31	.1093	.0068	.06	27.	30.	27.
70.000	.0553	.0032	.16	227.52	10.41	1.71	.0846	.0056	-.05	19.	22.	19.

TABLE II-4. THERMODYNAMIC STATISTICAL PARAMETERS

APRIL

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1017.4000	7.8839	-.37	282.64	4.24	.47	1250.0000	23.9300	-.11	527.	527.	527.
.003	1017.1000	7.8859	-.36	282.64	4.24	.46	1250.0000	24.0000	-.10	533.	533.	533.
1.000	902.1500	7.0023	-.35	280.83	6.27	-.19	1117.0000	25.9200	.16	533.	533.	533.
2.000	798.2700	6.9915	-.26	275.90	5.74	-.44	1006.0000	18.9700	.25	533.	533.	533.
3.000	704.7100	7.1919	-.26	270.83	4.97	-.66	905.4000	12.9100	.32	533.	533.	533.
4.000	620.6000	7.4450	-.30	265.42	4.74	-.76	813.9000	9.6910	.29	533.	533.	533.
5.000	545.0900	7.6271	-.40	259.35	4.77	-.72	731.8000	7.9140	.02	533.	533.	533.
6.000	477.2800	7.6850	-.46	252.75	4.89	-.72	657.6000	6.7900	-.04	532.	532.	532.
7.000	416.1700	7.5942	-.47	245.84	4.96	-.60	589.7000	6.1080	-.43	532.	532.	532.
8.000	361.7600	7.4833	-.48	238.79	4.69	-.32	527.7000	5.9090	-.80	532.	532.	532.
9.000	313.0400	7.1894	-.43	231.61	4.24	-.26	470.8000	6.8050	-1.26	531.	531.	531.
10.000	269.5900	6.6313	-.33	224.98	3.61	-.16	417.5000	8.9750	-1.41	531.	531.	531.
11.000	231.4200	5.7948	-.18	219.50	3.81	.64	367.4000	11.6400	-1.02	528.	528.	528.
12.000	197.9800	4.7335	-.07	216.23	5.25	.60	319.3000	13.4700	-.42	526.	526.	526.
13.000	169.1400	3.6542	-.03	215.45	5.85	-.12	273.8000	12.1400	.18	525.	525.	525.
14.000	144.4300	2.7738	-.11	215.32	4.70	-.68	233.8000	8.7020	.48	524.	524.	524.
15.000	123.3100	2.1458	-.14	214.48	3.63	-.31	200.4000	6.1000	.10	524.	524.	524.
16.000	105.1900	1.6853	-.13	213.31	3.23	-.18	171.9000	4.6870	-.03	521.	521.	521.
17.000	89.6970	1.3247	-.08	212.67	3.17	-.04	147.0000	3.7850	-.14	513.	513.	513.
18.000	76.4510	1.0474	.00	212.48	3.09	-.05	125.4000	2.9770	-.14	505.	505.	505.
19.000	65.1780	.8496	.03	213.11	2.90	.08	106.6000	2.2660	-.19	501.	501.	501.
20.000	55.6100	.6977	.09	214.29	2.63	.16	90.4200	1.6870	-.23	497.	497.	497.
21.000	47.4890	.5869	.15	215.82	2.67	.25	76.6700	1.3230	-.27	480.	480.	480.
22.000	40.6050	.5120	.16	217.12	2.73	.29	65.1600	1.0200	-.39	465.	465.	465.
23.000	34.7600	.4580	.10	218.37	2.73	.28	55.4600	.7879	-.41	461.	461.	461.
24.000	29.7690	.4119	.02	219.68	2.79	.22	47.2100	.6384	-.16	454.	454.	454.
25.000	25.5290	.3785	-.08	220.91	2.80	.09	40.2600	.5350	-.05	445.	445.	445.
26.000	21.9150	.3496	-.20	222.32	2.94	-.01	34.3400	.4645	.07	432.	432.	432.
27.000	18.8270	.3177	-.29	223.76	2.92	-.30	29.3100	.4043	.14	400.	400.	400.
28.000	16.1870	.2931	-.40	225.36	2.94	-.46	25.0200	.3654	-.06	378.	378.	378.
29.000	13.9430	.2622	-.43	227.05	2.81	-.41	21.3900	.3275	-.18	336.	336.	336.
30.000	12.0370	.2384	-.50	228.99	2.92	-.26	18.3100	.3025	-.33	303.	303.	303.
32.000	8.9553	.2743	.76	235.85	4.60	.68	13.2400	.3083	.36	99.	102.	98.
34.000	6.7504	.2205	1.07	241.18	4.84	.50	9.7520	.2579	.44	99.	101.	99.
36.000	5.1073	.1769	1.27	246.35	4.85	.31	7.2250	.2092	.55	99.	101.	97.
38.000	3.9031	.1491	1.23	252.53	4.06	.14	5.3850	.1823	.77	99.	101.	99.
40.000	2.9969	.1206	1.30	258.32	4.78	-.01	4.0420	.1523	.78	99.	102.	99.
42.000	2.3154	.0972	1.36	263.65	4.95	.01	3.0560	.1165	.92	99.	99.	99.
44.000	1.7985	.0798	1.38	268.65	5.21	-.06	2.3300	.0937	1.06	98.	95.	98.
46.000	1.4003	.0634	1.42	271.14	5.03	.16	1.7980	.0741	1.37	98.	95.	98.
48.000	1.0934	.0516	1.34	272.31	4.89	.03	1.3990	.0589	1.29	98.	93.	98.
50.000	.8537	.0423	1.35	271.80	5.06	.25	1.0940	.0468	1.11	97.	95.	97.
52.000	.6667	.0349	1.29	269.80	4.71	.39	.8603	.0379	1.44	95.	93.	95.
54.000	.5191	.0288	1.25	267.38	4.83	.01	.6756	.0305	1.25	94.	92.	94.
56.000	.4024	.0236	1.32	264.80	4.68	.17	.5289	.0251	1.34	85.	85.	85.
58.000	.3117	.0201	1.29	261.16	5.99	-.11	.4158	.0217	1.19	78.	80.	78.
60.000	.2388	.0150	1.24	256.87	6.86	.19	.3240	.0150	.86	64.	66.	64.
62.000	.1802	.0098	.50	251.42	7.98	.19	.2500	.0099	-.11	48.	50.	48.
64.000	.1349	.0074	.98	245.19	8.85	.98	.1925	.0087	.72	30.	32.	30.
66.000	.1023	.0064	.96	238.75	8.00	1.17	.1495	.0070	.63	26.	27.	26.
68.000	.0766	.0050	.70	231.81	10.29	1.64	.1153	.0058	.64	22.	23.	22.
70.000	.0574	.0046	.49	225.42	13.51	1.44	.0888	.0052	.74	18.	19.	18.

TABLE II-5. THERMODYNAMIC STATISTICAL PARAMETERS

MAY

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1016.6000	6.2061	-.04	287.95	3.76	.34	1224.0000	20.3600	.01	540.	540.	540.
.003	1016.3000	6.2930	.00	287.92	3.75	.34	1223.0000	20.4000	.00	550.	550.	550.
1.000	903.3800	5.3942	-.38	285.41	4.65	-.37	1099.0000	19.8300	.39	548.	548.	548.
2.000	801.0200	5.1860	-.67	280.18	4.23	-.68	993.5000	14.4200	.53	547.	547.	547.
3.000	708.5500	5.3030	-.81	274.97	3.82	-.95	896.1000	9.8750	.62	546.	546.	546.
4.000	625.1800	5.4731	-.95	269.58	3.63	-1.14	807.0000	7.3940	.53	546.	546.	546.
5.000	550.3200	5.6641	-1.05	263.72	3.86	-1.17	726.4000	6.6710	.46	546.	546.	546.
6.000	482.9300	5.7671	-1.11	257.23	4.12	-1.10	653.7000	5.8830	.30	546.	546.	546.
7.000	422.1000	5.8194	-1.12	250.19	4.36	-.99	587.6000	5.2790	.26	546.	546.	546.
8.000	367.7800	5.8372	-1.13	242.89	4.35	-.75	527.4000	4.7600	-.11	545.	545.	545.
9.000	319.0000	5.7558	-1.07	235.35	4.07	-.49	472.1000	4.6090	-.79	544.	544.	544.
10.000	275.3200	5.4980	-.91	227.97	3.50	-.28	420.7000	5.7960	-2.17	543.	543.	543.
11.000	236.6700	5.0148	-.73	221.13	3.18	.08	372.9000	7.9050	-2.17	542.	542.	542.
12.000	202.5600	4.2614	-.54	215.64	3.94	.95	327.4000	9.9740	-1.47	540.	540.	540.
13.000	172.8600	3.4511	-.35	212.78	5.11	.61	283.2000	10.7000	-.64	540.	540.	540.
14.000	147.3100	2.6627	-.27	212.81	4.74	.06	241.3000	8.4730	-.16	539.	539.	539.
15.000	125.5900	2.0876	-.24	213.07	3.59	.00	205.4000	5.8700	-.13	535.	535.	535.
16.000	107.0600	1.6614	-.18	212.53	3.27	-.01	175.5000	4.6160	-.16	534.	534.	534.
17.000	91.2320	1.3186	-.13	212.27	3.03	.05	149.8000	3.6490	-.19	532.	532.	532.
18.000	77.7570	1.0548	-.07	212.76	2.73	.09	127.3000	2.8080	-.16	530.	530.	530.
19.000	66.3270	.8574	-.05	213.97	2.49	.05	108.0000	2.1370	-.01	526.	526.	526.
20.000	56.6310	.7104	-.05	215.50	2.25	.03	91.5600	1.5910	.01	521.	521.	521.
21.000	48.4140	.6035	-.03	217.27	2.14	.01	77.6300	1.2270	-.09	501.	501.	501.
22.000	41.4440	.5223	-.01	218.77	2.00	.17	66.0000	.9293	-.03	497.	497.	497.
23.000	35.5180	.4487	.04	220.13	1.85	.24	56.2100	.7165	-.06	485.	485.	485.
24.000	30.4550	.3985	.10	221.54	1.77	.37	47.8900	.5842	-.23	476.	476.	476.
25.000	26.1550	.3561	.09	222.93	1.71	.32	40.8700	.4824	-.12	474.	474.	474.
26.000	22.4890	.3185	.10	224.45	1.80	.24	34.9000	.4244	.02	459.	459.	459.
27.000	19.3510	.2869	.12	226.02	1.86	.14	29.8300	.3909	.12	425.	425.	425.
28.000	16.6830	.2519	.28	227.75	1.88	.25	25.5200	.3315	.17	394.	394.	394.
29.000	14.3890	.2284	.28	229.56	2.00	.29	21.8400	.2995	.21	358.	358.	358.
30.000	12.4290	.2002	.22	231.38	2.01	-.01	18.7100	.2725	.14	319.	319.	319.
32.000	9.3019	.2211	.72	237.81	3.12	.68	13.6300	.2848	1.04	133.	135.	130.
34.000	7.0223	.1803	.76	242.77	3.53	1.10	10.0800	.2127	.58	130.	132.	130.
36.000	5.3288	.1444	.51	248.42	3.24	-.10	7.4760	.1826	.64	129.	131.	129.
38.000	4.0739	.1159	.57	254.45	3.30	.07	5.5790	.1359	.29	127.	129.	127.
40.000	3.1335	.0951	.53	260.20	3.30	.13	4.1950	.1126	.59	127.	129.	127.
42.000	2.4253	.0767	.54	265.15	3.49	.08	3.1860	.0910	.24	127.	127.	127.
44.000	1.8856	.0625	.59	269.55	3.75	.09	2.4340	.0712	.30	127.	120.	127.
46.000	1.4709	.0517	.65	272.57	3.98	.34	1.8800	.0565	.38	125.	118.	125.
48.000	1.1496	.0424	.68	273.26	3.92	.19	1.4660	.0474	.40	125.	118.	125.
50.000	.8983	.0350	.73	272.63	4.40	.24	1.1480	.0380	.49	123.	114.	123.
52.000	.7014	.0289	.80	270.96	4.91	1.35	.9009	.0322	.58	121.	111.	121.
54.000	.5458	.0239	.85	267.97	4.17	.88	.7088	.0267	.61	115.	113.	115.
56.000	.4243	.0189	.78	264.21	4.93	-.46	.5588	.0213	.70	108.	109.	108.
58.000	.3288	.0158	.75	260.51	5.16	.55	.4396	.0169	.50	103.	105.	103.
60.000	.2535	.0133	.83	256.40	6.06	.49	.3444	.0144	.42	97.	98.	97.
62.000	.1937	.0097	.84	250.85	6.70	.55	.2690	.0107	.29	79.	80.	79.
64.000	.1465	.0073	1.11	243.06	7.29	.81	.2100	.0086	-.01	60.	60.	60.
66.000	.1100	.0050	32	235.60	7.73	1.03	.1635	.0066	.10	53.	53.	53.
68.000	.0821	.0040	34	228.48	8.83	1.31	.1264	.0053	.14	50.	50.	50.
70.000	.0609	.0034	36	216.78	12.71	1.60	.0982	.0045	.37	40.	40.	40.

TABLE II-6. THERMODYNAMIC STATISTICAL PARAMETERS

JUNE

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1017.0000	5.4004	-.37	292.57	3.02	-.13	1202.0000	16.6400	.34	523.	523.	523.
.003	1016.6000	5.3965	-.37	292.56	3.01	-.13	1202.0000	16.6100	.34	524.	524.	524.
1.000	905.4200	4.6170	-.65	289.63	3.49	-.71	1084.0000	15.3200	.57	524.	524.	524.
2.000	804.3400	4.3259	-.88	283.94	3.26	-.93	983.5000	11.8600	.70	524.	524.	524.
3.000	712.6300	4.2403	-1.02	278.69	2.98	-1.40	888.9000	8.5480	1.00	524.	524.	524.
4.000	629.9700	4.2489	-1.12	273.46	2.79	-1.63	801.4000	6.4950	1.09	524.	524.	524.
5.000	555.6400	4.2197	-1.20	267.92	2.75	-1.73	721.8000	5.3020	.74	524.	524.	524.
6.000	488.6800	4.2503	-1.38	261.77	2.90	-1.33	650.0000	4.9280	.11	524.	524.	524.
7.000	428.2000	4.2600	-1.44	255.10	3.16	-1.17	584.6000	4.5420	.08	523.	523.	523.
8.000	374.0900	4.2107	-1.42	248.07	3.29	-.95	525.3000	4.2820	.11	523.	523.	523.
9.000	325.4700	4.1447	-1.34	240.63	3.29	-.65	471.2000	4.0190	-.45	522.	522.	522.
10.000	281.8900	4.0579	-1.19	232.96	3.11	-.43	421.5000	3.9910	-1.47	520.	520.	520.
11.000	243.0600	3.8420	-.99	225.34	2.89	-.35	375.8000	4.5760	-2.72	520.	520.	520.
12.000	208.4000	3.4228	-.78	218.21	2.65	.07	332.7000	5.4820	-2.40	519.	519.	519.
13.000	178.1300	2.9829	-.55	212.94	3.21	.81	291.5000	6.9290	-1.58	516.	516.	516.
14.000	151.6900	2.4197	-.37	210.74	3.90	.41	250.9000	7.3340	-.60	514.	514.	514.
15.000	129.0700	1.8496	-.36	210.11	3.74	-.05	214.1000	6.0970	-.10	513.	513.	513.
16.000	109.8000	1.4146	-.36	209.95	3.31	-.21	182.3000	4.5930	-.09	512.	512.	512.
17.000	93.4190	1.0867	-.36	210.57	2.85	.01	154.6000	3.3280	-.16	511.	511.	511.
18.000	79.5390	.8617	-.33	211.86	2.51	.08	130.8000	2.3690	-.18	509.	509.	509.
19.000	67.8220	.7085	-.29	213.78	2.10	-.23	110.5000	1.6690	-.07	507.	507.	507.
20.000	57.9110	.6039	-.21	215.65	1.82	-.10	93.5600	1.2300	-.23	500.	500.	500.
21.000	49.5140	.5226	-.12	217.55	1.66	.03	79.2900	.9506	-.20	490.	490.	490.
22.000	42.3950	.4567	-.06	219.36	1.57	.04	67.3300	.7572	-.00	475.	475.	475.
23.000	36.3560	.4017	-.05	221.07	1.52	.22	57.2900	.6122	-.10	472.	472.	472.
24.000	31.2040	.3586	-.04	222.78	1.52	.03	48.8000	.5312	-.06	465.	465.	465.
25.000	26.8280	.3233	-.06	224.41	1.57	-.03	41.6500	.4633	.09	472.	472.	472.
26.000	23.0910	.2847	-.04	226.01	1.65	-.27	35.5900	.3984	.09	464.	464.	464.
27.000	19.8870	.2541	-.07	227.68	1.73	-.38	30.4300	.3575	.17	451.	451.	451.
28.000	17.1570	.2260	-.08	229.49	1.64	-.12	26.0400	.3118	.05	435.	435.	435.
29.000	14.8090	.2028	-.10	231.25	1.80	-.20	22.3100	.2785	-.09	401.	401.	401.
30.000	12.8060	.1799	-.15	232.96	1.75	-.40	19.1500	.2485	-.19	363.	363.	363.
32.000	9.6015	.2225	.07	238.45	2.88	.87	14.0400	.2336	-.30	102.	102.	99.
34.000	7.2459	.1894	.17	243.05	3.17	.06	10.3900	.2182	-.18	101.	101.	98.
36.000	5.5147	.1482	.34	248.26	3.18	-.31	7.7400	.1656	-.23	98.	98.	97.
38.000	4.2169	.1200	.44	254.13	2.65	-.23	5.7810	.1395	.11	97.	97.	97.
40.000	3.2410	.1013	.26	260.04	3.25	-.12	4.3420	.1219	-.38	97.	97.	97.
42.000	2.5093	.0795	.54	265.20	3.70	-.04	3.2940	.0910	.13	97.	95.	97.
44.000	1.9517	.0653	.57	270.24	4.31	.09	2.5140	.0735	.39	97.	92.	97.
46.000	1.5234	.0542	.55	272.87	4.12	.11	1.9450	.0567	.61	97.	91.	97.
48.000	1.1917	.0450	.49	273.75	3.84	-.29	1.5160	.0492	.42	95.	88.	95.
50.000	.9321	.0368	.47	273.05	3.50	-.32	1.1890	.0423	.30	94.	92.	94.
52.000	.7281	.0303	.46	270.83	3.42	-.27	.9361	.0340	.41	92.	87.	92.
54.000	.5679	.0247	.41	268.10	4.35	.24	.7383	.0280	.35	89.	91.	89.
56.000	.4409	.0210	.32	264.36	4.97	.27	.5813	.0231	.20	83.	85.	83.
58.000	.3416	.0177	.31	259.65	5.59	.30	.4583	.0192	-.06	73.	75.	73.
60.000	.2615	.0136	.54	253.89	6.05	.08	.3586	.0145	.22	61.	63.	61.
62.000	.1968	.0096	.89	248.03	7.36	-.07	.2765	.0091	.68	43.	45.	43.
64.000	.1475	.0069	.31	238.91	8.27	.21	.2153	.0064	.25	26.	28.	26.
66.000	.1109	.0060	.39	230.80	8.68	.24	.1676	.0052	-.12	23.	25.	23.
68.000	.0822	.0050	.53	222.66	10.35	.34	.1292	.0040	-.10	20.	22.	20.
70.000	.0598	.0037	.50	209.34	10.39	-.45	.0995	.0043	-.16	17.	17.	17.

TABLE II-7. THERMODYNAMIC STATISTICAL PARAMETERS

JULY

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1016.9000	4.5761	.02	295.46	2.74	.58	1189.0000	14.3500	-.07	567.	567.	567.
.003	1016.6000	4.5776	.02	295.44	2.73	.57	1188.0000	14.3300	-.07	568.	568.	568.
1.000	906.2900	3.8458	-.16	291.76	2.84	-.17	1076.0000	13.0600	.32	568.	568.	568.
2.000	805.8600	3.4064	-.26	285.85	2.55	-.46	978.1000	9.8960	.57	568.	568.	568.
3.000	714.6500	3.2338	-.26	280.59	2.07	-.27	884.8000	6.3400	.43	568.	568.	568.
4.000	632.3200	3.1390	-.33	275.24	1.88	-.19	798.8000	4.6640	.12	568.	568.	568.
5.000	558.2000	3.0253	-.39	269.77	1.92	-.40	719.9000	4.3500	.35	568.	568.	568.
6.000	491.4200	2.9852	-.44	263.93	2.17	-.53	648.1000	4.2380	.33	568.	568.	568.
7.000	431.1100	2.9834	-.47	257.49	2.48	-.58	583.0000	4.0440	.25	568.	568.	568.
8.000	377.1400	2.9602	-.54	250.58	2.73	-.64	524.2000	3.9210	.19	568.	568.	568.
9.000	328.5800	2.9645	-.57	243.27	2.88	-.73	470.5000	3.5560	.21	567.	567.	567.
10.000	285.0700	2.9707	-.63	235.65	2.81	-.69	421.4000	3.1530	-.20	567.	567.	567.
11.000	246.2400	2.9010	-.58	228.00	2.58	-.33	376.3000	3.2220	-.99	566.	566.	566.
12.000	211.4500	2.6554	-.47	220.70	2.37	.00	333.8000	3.9390	-1.91	565.	565.	565.
13.000	181.0100	2.3743	-.27	214.81	2.62	.40	293.6000	5.0850	-1.39	563.	563.	563.
14.000	154.2800	1.9651	-.07	210.84	3.17	.35	255.0000	5.8740	-.63	561.	561.	561.
15.000	131.2000	1.5069	.07	208.55	3.57	.23	219.2000	5.5440	-.17	560.	560.	560.
16.000	111.4900	1.1263	.14	208.55	3.34	.00	186.3000	4.2890	.15	560.	560.	560.
17.000	94.8030	.8522	.10	210.15	2.62	-.06	157.2000	2.8090	.20	557.	557.	557.
18.000	80.7100	.6919	.08	212.05	2.08	-.03	132.6000	1.8790	.25	552.	552.	552.
19.000	68.8310	.5772	.01	214.24	1.86	.11	111.9000	1.3160	.23	539.	539.	539.
20.000	58.7910	.5014	.02	216.26	1.72	.05	94.7100	.9068	.27	536.	536.	536.
21.000	50.2900	.4424	-.01	218.23	1.64	-.16	80.2800	.7745	.24	530.	530.	530.
22.000	43.0710	.3870	-.06	219.93	1.59	.04	68.2300	.6354	.04	509.	509.	509.
23.000	36.9470	.3470	-.02	221.64	1.50	-.04	58.0700	.5320	-.05	500.	500.	500.
24.000	31.7260	.3143	-.01	223.36	1.49	.14	49.4800	.4526	-.02	495.	495.	495.
25.000	27.2900	.2841	-.02	224.96	1.54	.25	42.2600	.4004	-.05	501.	501.	501.
26.000	23.4900	.2560	-.01	226.53	1.59	.44	36.1200	.3490	-.04	492.	492.	492.
27.000	20.2400	.2308	-.01	228.08	1.70	.37	30.9200	.3205	-.04	473.	473.	473.
28.000	17.4540	.2042	-.11	229.48	1.63	-.16	26.5000	.2705	-.01	430.	430.	430.
29.000	15.0630	.1825	-.17	231.00	1.79	-.25	22.7200	.2435	.03	407.	407.	407.
30.000	13.0270	.1672	-.25	232.64	1.94	-.28	19.5100	.2152	.03	349.	349.	349.
32.000	9.7151	.2022	.74	237.04	2.60	.30	14.2800	.2602	.03	101.	102.	100.
34.000	7.3176	.1719	.71	241.23	3.02	.35	10.5700	.1997	.01	102.	102.	101.
36.000	5.5494	.1395	.85	246.21	2.75	.10	7.8510	.1605	.09	101.	101.	101.
38.000	4.2299	.1147	.91	250.95	3.08	.25	5.8710	.1287	.70	101.	101.	101.
40.000	3.2415	.0952	.88	256.07	4.00	-.04	4.4100	.1104	.81	101.	101.	101.
42.000	2.4972	.0787	.87	261.56	4.38	-.82	3.3260	.0948	.78	99.	99.	99.
44.000	1.9353	.0649	.83	266.12	4.17	.04	2.5300	.0726	.62	99.	94.	99.
46.000	1.5059	.0538	.78	269.53	4.13	.36	1.9440	.0586	.92	99.	91.	99.
48.000	1.1738	.0443	.75	270.32	3.83	.04	1.5110	.0491	.71	98.	90.	98.
50.000	.9151	.0360	.74	269.01	4.06	.05	1.1830	.0416	.56	98.	88.	98.
52.000	.7125	.0293	.72	266.91	4.30	.21	.9290	.0342	.69	97.	93.	97.
54.000	.5526	.0242	.75	263.28	4.83	.05	.7306	.0278	.66	93.	91.	93.
56.000	.4271	.0191	.70	259.49	5.67	.10	.5734	.0223	.48	88.	88.	88.
58.000	.3292	.0162	.65	254.43	6.84	.06	.4509	.0183	.45	82.	82.	82.
60.000	.2511	.0128	.32	248.54	7.90	.32	.3520	.0122	-.28	63.	63.	63.
62.000	.1893	.0094	.45	241.23	7.34	.48	.2734	.0096	-.02	45.	45.	45.
64.000	.1424	.0075	.62	235.18	7.96	-.02	.2110	.0080	.37	40.	40.	40.
66.000	.1066	.0065	.66	230.45	9.33	.38	.1612	.0062	.64	38.	38.	38.
68.000	.0793	.0061	.65	224.75	11.84	.88	.1228	.0060	.60	32.	32.	32.
70.000	.0594	.0055	.87	217.06	17.65	.81	.0954	.0051	-.39	20.	20.	20.

TABLE II-8. THERMODYNAMIC STATISTICAL PARAMETERS

AUGUST

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1017.7000	3.7795	-.17	295.26	3.05	-.08	1190.0000	15.8300	.33	586.	586.	586.
.003	1017.3000	3.7689	-.17	295.26	3.05	-.09	1190.0000	15.8000	.33	589.	589.	589.
1.000	906.9200	3.1542	-.27	291.47	2.94	-.63	1078.0000	12.7900	.64	589.	589.	589.
2.000	806.3500	2.9446	-.26	285.92	2.37	-.68	978.4000	8.4310	.63	588.	588.	588.
3.000	715.1700	2.8973	-.21	280.89	1.91	-.51	884.6000	5.6310	.30	588.	588.	588.
4.000	632.8900	2.8176	-.20	275.65	1.73	-.33	798.4000	4.5270	.07	587.	587.	587.
5.000	558.8200	2.6889	-.32	270.23	1.66	-.23	719.5000	4.1110	.06	586.	586.	586.
6.000	492.0800	2.5705	-.28	264.32	1.75	-.19	648.0000	3.5310	-.33	581.	581.	581.
7.000	431.7400	2.5141	-.34	257.83	2.02	-.37	583.1000	3.4800	-.30	564.	564.	564.
8.000	377.7400	2.4743	-.37	250.94	2.21	-.41	524.3000	3.3880	-.18	559.	559.	559.
9.000	329.1900	2.4433	-.43	243.62	2.29	-.47	470.7000	3.0920	-.06	559.	559.	559.
10.000	285.6400	2.4296	-.50	235.90	2.31	-.45	421.8000	2.9020	-.24	558.	558.	558.
11.000	246.7600	2.3502	-.44	228.11	2.20	-.25	376.9000	2.9130	-.76	557.	557.	557.
12.000	211.9000	2.1478	-.32	220.59	2.11	.09	334.7000	3.3210	-1.30	557.	557.	557.
13.000	181.3400	1.9405	-.19	214.35	2.38	.26	294.8000	4.3280	-1.02	551.	551.	551.
14.000	154.5200	1.6264	-.02	210.15	2.83	.45	256.2000	4.9030	-.57	547.	547.	547.
15.000	131.3400	1.2804	.03	208.04	3.04	.14	220.0000	4.4030	-.09	547.	547.	547.
16.000	111.5900	1.0444	.15	208.01	2.78	-.17	186.9000	3.3810	.31	546.	546.	546.
17.000	94.8280	.8264	-.06	209.55	2.41	.15	157.7000	2.3960	.09	544.	544.	544.
18.000	80.6990	.7091	-.06	211.73	2.10	.04	132.8000	1.6890	-.08	542.	542.	542.
19.000	68.8120	.6107	-.05	214.03	1.88	.25	112.0000	1.2820	-.08	540.	540.	540.
20.000	58.7680	.5367	-.02	216.07	1.69	.26	94.7500	.9807	.09	538.	538.	538.
21.000	50.2620	.4754	.02	217.95	1.59	.15	80.3400	.7788	-.13	534.	534.	534.
22.000	43.0530	.4235	.02	219.65	1.51	.45	68.2800	.6392	-.49	509.	509.	509.
23.000	36.9240	.3790	.02	221.26	1.54	.06	58.1400	.5285	.10	504.	504.	504.
24.000	31.6970	.3455	.02	222.92	1.45	.14	49.5300	.4561	.03	501.	501.	501.
25.000	27.2470	.3105	.00	224.42	1.44	.01	42.3000	.3919	.07	509.	509.	509.
26.000	23.4480	.2746	.09	225.87	1.48	.03	36.1600	.3469	-.07	496.	496.	496.
27.000	20.1920	.2465	.08	227.34	1.59	-.08	30.9400	.3187	-.05	477.	477.	477.
28.000	17.4040	.2172	.03	228.70	1.58	-.05	26.5100	.2721	-.08	446.	446.	446.
29.000	15.0150	.1958	.03	230.09	1.62	-.14	22.7300	.2418	.07	412.	412.	412.
30.000	12.9740	.1808	-.01	231.44	1.68	-.52	19.5300	.2188	.09	369.	369.	369.
32.000	9.6310	.1522	.12	235.31	2.40	.45	14.2900	.1789	.33	114.	117.	104.
34.000	7.2427	.1265	.24	239.26	2.66	.36	10.5500	.1596	.17	114.	117.	109.
36.000	5.4853	.0962	.57	243.47	3.03	.36	7.8470	.1129	.34	110.	113.	110.
38.000	4.1678	.0814	.60	247.97	3.59	.14	5.8570	.0977	.32	110.	114.	110.
40.000	3.1828	.0715	.45	253.21	3.33	.51	4.3800	.0778	.32	107.	112.	107.
42.000	2.4458	.0585	.65	258.28	3.25	.70	3.2990	.0628	.35	107.	114.	107.
44.000	1.8891	.0488	.70	263.34	3.56	.28	2.5000	.0571	.22	107.	116.	107.
46.000	1.4647	.0393	.77	266.70	3.60	.36	1.9140	.0499	.48	106.	113.	106.
48.000	1.1388	.0320	.78	267.57	3.85	.20	1.4810	.0397	.65	105.	111.	105.
50.000	.8859	.0260	.78	267.15	3.70	.29	1.1530	.0323	.74	104.	108.	104.
52.000	.6883	.0213	.77	264.91	4.37	-.32	.9057	.0248	.64	101.	110.	101.
54.000	.5333	.0179	.84	261.99	4.88	.80	.7099	.0202	.66	95.	104.	95.
56.000	.4118	.0154	.90	258.02	5.49	.57	.5562	.0165	.43	88.	95.	88.
58.000	.3166	.0132	1.09	254.93	6.59	.70	.4332	.0134	.54	78.	84.	78.
60.000	.2420	.0111	1.33	249.53	6.34	.26	.3377	.0120	.78	63.	67.	63.
62.000	.1827	.0081	.79	242.67	7.15	.51	.2626	.0086	.39	51.	55.	51.
64.000	.1377	.0068	.94	236.55	7.69	.38	.2028	.0070	.38	48.	51.	48.
66.000	.1035	.0063	.85	231.52	9.05	.61	.1557	.0063	1.16	42.	45.	42.
68.000	.0767	.0052	1.07	226.43	9.82	1.11	.1180	.0051	1.00	38.	41.	38.
70.000	.0578	.0049	.49	218.74	12.79	1.60	.0904	.0038	.53	13.	26.	13.

TABLE II-9. THERMODYNAMIC STATISTICAL PARAMETERS

SEPTEMBER

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1018.2000	5.4960	-.59	292.29	3.93	-.42	1205.0000	20.6400	.46	544.	544.	544.
.003	1017.9000	5.4978	-.59	292.28	3.92	-.42	1205.0000	20.6200	.46	544.	544.	544.
1.000	906.1700	4.7303	-.69	288.61	3.63	-.54	1089.0000	16.0300	.46	544.	544.	544.
2.000	804.8500	4.4724	-.68	284.01	2.98	-.78	984.0000	10.4600	.56	544.	544.	544.
3.000	713.2600	4.3732	-.67	279.37	2.51	-.93	887.5000	7.2830	.38	544.	544.	544.
4.000	630.7300	4.2524	-.70	274.32	2.25	-.68	799.8000	6.0120	-.26	544.	544.	544.
5.000	556.5000	4.1054	-.80	268.75	2.38	-.47	720.6000	5.4840	-.33	543.	543.	543.
6.000	489.6500	3.9688	-.76	262.59	2.73	-.57	649.2000	5.1820	-.23	543.	543.	543.
7.000	429.2000	3.9645	-.77	255.82	2.98	-.57	584.2000	4.6820	-.13	543.	543.	543.
8.000	375.1500	3.8793	-.76	248.76	3.18	-.53	525.3000	4.2420	-.29	540.	540.	540.
9.000	326.4900	3.8624	-.75	241.30	3.27	-.48	471.3000	3.8110	-.34	538.	538.	538.
10.000	282.9100	3.8083	-.70	233.73	3.09	-.39	421.7000	3.5590	-.83	538.	538.	538.
11.000	244.0800	3.6185	-.63	226.38	2.78	-.26	375.6000	4.2090	-1.58	536.	536.	536.
12.000	209.4800	3.2179	-.52	219.77	2.59	.10	332.1000	5.3040	-1.45	536.	536.	536.
13.000	179.2200	2.8247	-.36	214.51	2.79	.36	291.1000	6.1160	-.99	534.	534.	534.
14.000	152.7400	2.3314	-.24	210.50	3.04	.48	252.9000	6.1910	-.63	534.	534.	534.
15.000	129.8300	1.8383	-.15	207.84	3.36	.32	217.7000	5.7420	-.25	533.	533.	533.
16.000	110.2300	1.4330	-.19	207.04	3.65	.15	185.6000	4.9480	.01	530.	530.	530.
17.000	93.5950	1.0847	-.10	208.18	3.41	.07	156.7000	3.6430	.04	528.	528.	528.
18.000	79.5590	.8707	-.07	210.36	2.95	.18	131.8000	2.5410	-.06	526.	526.	526.
19.000	67.7740	.7098	-.18	212.91	2.50	.33	110.9000	1.7480	-.22	525.	525.	525.
20.000	57.8350	.6134	-.10	215.11	2.15	.29	93.6700	1.2550	-.27	519.	519.	519.
21.000	49.4310	.5402	-.01	217.15	1.87	.20	79.3000	.9246	-.35	505.	505.	505.
22.000	42.3080	.4840	.08	218.72	1.74	.08	67.3900	.7518	-.31	493.	493.	493.
23.000	36.2500	.4297	.12	220.31	1.63	.00	57.3300	.6207	-.17	488.	488.	488.
24.000	31.0390	.3894	.14	221.88	1.63	-.01	48.8300	.5298	-.10	478.	478.	478.
25.000	26.7180	.3489	.13	223.39	1.60	-.03	41.6700	.4550	-.07	484.	484.	484.
26.000	22.9730	.3127	.18	224.86	1.57	.09	35.5900	.4121	-.03	465.	465.	465.
27.000	19.7680	.2804	.17	226.29	1.65	.36	30.4300	.3738	.09	429.	429.	429.
28.000	17.0270	.2536	.19	227.48	1.69	.45	26.0800	.3154	.28	406.	406.	406.
29.000	14.6730	.2275	.24	228.51	1.71	.25	22.3700	.2772	.23	373.	373.	373.
30.000	12.6640	.2017	.19	229.71	1.78	.05	19.2100	.2513	.19	330.	330.	330.
32.000	9.4362	.1853	.93	233.68	2.54	.23	14.0900	.2094	.57	99.	101.	92.
34.000	7.0730	.1454	1.19	237.16	2.78	.49	10.4000	.1830	.29	98.	100.	92.
36.000	5.3439	.1246	1.05	241.28	3.16	.81	7.7220	.1468	.79	97.	99.	95.
38.000	4.0531	.1032	1.01	246.90	3.26	.22	5.7220	.1163	.52	96.	98.	95.
40.000	3.0946	.0854	.97	252.59	3.62	-.07	4.2690	.0982	.66	95.	98.	95.
42.000	2.3755	.0702	.97	257.97	3.51	-.13	3.2090	.0816	.61	94.	97.	94.
44.000	1.8344	.0572	1.01	263.31	3.76	.10	2.4280	.0708	.58	93.	96.	93.
46.000	1.4228	.0470	1.00	266.70	4.32	.14	1.8590	.0520	1.09	92.	95.	92.
48.000	1.1058	.0391	1.00	267.75	4.27	-.38	1.4370	.0429	.68	89.	88.	89.
50.000	.8597	.0329	.98	267.26	4.47	-.38	1.1190	.0357	.56	88.	86.	88.
52.000	.6675	.0266	1.05	266.35	5.03	.34	.8725	.0295	.55	85.	86.	85.
54.000	.5177	.0227	1.07	264.57	5.46	.07	.6811	.0236	.98	81.	81.	81.
56.000	.4009	.0190	.98	261.74	6.19	.05	.5334	.0196	1.09	74.	77.	74.
58.000	.3090	.0154	.64	257.92	5.82	.07	.4173	.0159	.94	67.	70.	67.
60.000	.2349	.0118	.70	252.12	6.38	.09	.3243	.0115	.81	53.	55.	53.
62.000	.1783	.0093	.68	247.07	6.83	.26	.2513	.0099	.79	44.	46.	44.
64.000	.1347	.0078	.87	242.09	7.90	.57	.1937	.0085	1.02	35.	37.	35.
66.000	.1019	.0066	.95	237.77	8.88	1.04	.1489	.0067	.94	36.	38.	36.
68.000	.0763	.0046	.27	231.90	9.72	1.23	.1144	.0045	.88	29.	31.	29.
70.000	.0563	.0037	.26	221.27	9.73	.45	.0881	.0035	-.13	11.	19.	11.

TABLE II-10. THERMODYNAMIC STATISTICAL PARAMETERS

OCTOBER

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1019.4000	6.9343	-.40	286.28	5.29	-.40	1235.0000	29.3400	.42	565.	565.	565.
.003	1019.0000	6.9577	-.40	286.26	5.27	-.39	1235.0000	29.2900	.42	567.	567.	567.
1.000	904.9600	5.8167	-.53	283.11	5.18	-.54	1110.0000	23.0900	.45	567.	567.	567.
2.000	801.8900	5.5550	-.57	279.47	4.67	-.92	997.6000	15.9900	.68	567.	567.	567.
3.000	709.2900	5.6205	-.69	275.37	4.13	-1.03	896.1000	11.0400	.66	567.	567.	567.
4.000	625.9900	5.8515	-.79	270.38	4.09	-1.18	805.8000	8.7710	.67	567.	567.	567.
5.000	551.2700	6.0085	-.92	264.66	4.18	-1.17	725.2000	7.5480	.34	567.	567.	567.
6.000	483.9500	6.0587	-.99	258.15	4.28	-1.08	652.8000	6.5990	-.11	567.	567.	567.
7.000	423.2200	6.0548	-1.03	251.08	4.33	-.84	587.1000	5.8280	-.29	566.	566.	568.
8.000	368.9100	6.0140	-1.01	243.81	4.23	-.40	527.1000	5.5750	-.57	562.	562.	562.
9.000	320.1700	5.8369	-.91	236.41	3.94	-.04	471.8000	5.8970	-1.44	561.	561.	561.
10.000	276.5600	5.4920	-.71	229.18	3.68	.09	420.4000	6.7520	-2.02	561.	561.	561.
11.000	237.9700	5.0093	-.52	222.77	3.54	.26	372.2000	8.0330	-1.72	561.	561.	561.
12.000	203.9400	4.3154	-.36	217.80	3.68	.24	326.3000	9.0190	-1.09	560.	560.	560.
13.000	174.2900	3.6599	-.17	214.35	3.66	.13	283.4000	8.7680	-.55	559.	559.	559.
14.000	148.6000	2.9476	-.07	211.67	3.61	.13	244.7000	7.8590	-.24	556.	556.	556.
15.000	126.4500	2.2899	-.03	209.70	3.78	.19	210.2000	6.9080	-.06	554.	554.	554.
16.000	107.4900	1.7515	-.02	208.60	3.92	.05	179.6000	5.6850	.04	550.	550.	550.
17.000	91.3640	1.3130	-.06	209.22	3.72	.06	152.2000	4.3240	.04	544.	544.	544.
18.000	77.7060	1.0176	-.07	210.72	3.30	.05	128.5000	3.0950	.02	537.	537.	537.
19.000	66.2020	.8216	-.07	212.63	2.81	.09	108.5000	2.1030	.00	532.	532.	532.
20.000	56.4760	.6939	-.04	214.21	2.62	-.01	91.8600	1.5320	.02	529.	529.	529.
21.000	48.2310	.6032	.05	215.66	2.50	-.01	77.9200	1.1930	-.01	507.	507.	507.
22.000	41.2370	.5363	.09	216.97	2.41	-.02	66.2200	.9503	-.19	501.	501.	501.
23.000	35.2980	.4802	.12	218.25	2.32	.07	56.3500	.7610	-.34	495.	495.	495.
24.000	30.2270	.4299	.15	219.49	2.36	.19	47.9800	.6361	-.51	492.	492.	492.
25.000	25.9190	.3905	.13	220.64	2.47	.31	40.9200	.5470	-.52	491.	491.	491.
26.000	22.2400	.3528	.10	221.81	2.50	.19	34.9300	.4697	-.27	475.	475.	475.
27.000	19.0990	.3250	.07	223.02	2.59	.17	29.8300	.4052	-.08	435.	435.	435.
28.000	16.4190	.3001	.08	224.17	2.53	.35	25.5200	.3485	-.01	407.	407.	407.
29.000	14.1250	.2719	.07	225.37	2.55	.26	21.8300	.3009	.09	373.	373.	373.
30.000	12.1660	.2488	.10	226.73	2.75	.08	18.6900	.2809	.15	332.	332.	332.
32.000	9.0512	.2771	.21	231.42	4.71	.36	13.6400	.2713	-.25	107.	108.	101.
34.000	6.7766	.2362	.32	234.51	4.88	.21	10.0700	.2398	.19	104.	105.	102.
36.000	5.0818	.1989	.42	237.65	4.58	-.19	7.4520	.2036	.22	102.	104.	99.
38.000	3.8426	.1686	.31	243.44	5.14	-.41	5.5000	.1733	.47	101.	103.	101.
40.000	2.9219	.1403	.24	249.05	5.64	-.53	4.0880	.1473	.53	101.	103.	101.
42.000	2.2321	.1157	.13	253.91	5.73	-.39	3.0640	.1297	.36	101.	103.	101.
44.000	1.7175	.0945	.14	259.52	6.02	-.25	2.3060	.1009	.31	101.	103.	101.
46.000	1.3261	.0774	.17	263.72	5.98	-.35	1.7500	.0819	.30	99.	98.	99.
48.000	1.0276	.0630	.15	265.57	5.99	-.54	1.3470	.0684	.17	98.	96.	98.
50.000	.7974	.0514	.17	265.86	6.46	-.30	1.0430	.0567	.12	97.	95.	97.
52.000	.6193	.0424	.21	265.49	6.23	.25	.8116	.0463	.10	96.	96.	96.
54.000	.4799	.0338	.18	264.44	5.54	-.01	.6317	.0375	.10	94.	96.	94.
56.000	.3711	.0266	.10	262.05	5.54	.19	.4928	.0304	-.06	86.	88.	86.
58.000	.2875	.0206	.46	260.05	6.51	.32	.3848	.0242	.16	78.	81.	78.
60.000	.2199	.0148	.31	256.95	7.95	.34	.2973	.0185	.03	61.	63.	61.
62.000	.1692	.0106	-.08	253.44	9.19	.58	.2324	.0155	.30	39.	43.	39.
64.000	.1299	.0087	-.22	250.65	10.66	.60	.1805	.0117	.02	36.	39.	36.
66.000	.0991	.0071	-.10	246.28	14.22	.71	.1397	.0087	-.03	32.	34.	32.
68.000	.0754	.0057	.23	242.44	18.39	.64	.1086	.0069	.01	29.	32.	29.
70.000	.0567	.0052	.26	235.38	21.36	.63	.0833	.0047	.50	20.	23.	20.

TABLE II-11. THERMODYNAMIC STATISTICAL PARAMETERS

NOVEMBER

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1019.0000	8.4183	-.58	281.19	5.60	-.12	1259.0000	31.5300	.18	537.	537.	537.
.003	1018.6000	8.4138	-.58	281.18	5.60	-.12	1258.0000	31.5000	.18	537.	537.	537.
1.000	902.7600	7.3503	-.67	278.85	6.54	-.29	1126.0000	27.8700	.25	537.	537.	537.
2.000	798.3700	7.3870	-.63	275.29	5.88	-.63	1009.0000	19.0200	.47	537.	537.	537.
3.000	704.8600	7.7176	-.65	271.24	5.55	-.76	904.4000	13.6800	.50	537.	537.	537.
4.000	620.7600	8.0665	-.67	266.20	5.37	-.77	811.8000	10.6600	.41	536.	536.	536.
5.000	545.4400	8.3421	-.70	260.17	5.33	-.72	730.0000	8.7820	.17	536.	536.	536.
6.000	477.7900	8.3712	-.70	253.62	5.23	-.56	656.1000	7.4500	-.07	535.	535.	535.
7.000	416.8200	8.2207	-.65	246.64	5.11	-.34	588.7000	6.9120	-.49	534.	534.	534.
8.000	362.4800	7.9985	-.58	239.60	4.82	-.11	527.0000	7.2270	-.97	533.	533.	533.
9.000	313.8100	7.6164	-.48	232.56	4.44	.00	470.1000	8.2990	-1.52	533.	533.	533.
10.000	270.4200	6.9776	-.33	226.05	3.97	.15	416.8000	9.7950	-1.56	532.	532.	532.
11.000	232.2700	6.1493	-.16	220.58	3.96	.44	366.9000	11.3200	-1.11	530.	530.	530.
12.000	198.8300	5.1650	-.03	216.94	4.50	.44	319.5000	12.0800	-.59	528.	528.	528.
13.000	169.8500	4.1937	.11	214.58	4.61	.17	276.0000	11.1100	-.19	526.	526.	526.
14.000	144.8400	3.3050	.20	212.59	4.30	.05	237.5000	9.2300	.05	524.	524.	524.
15.000	123.3800	2.5732	.24	210.85	4.01	.22	204.0000	7.4310	.15	521.	521.	521.
16.000	104.9700	1.9640	.24	209.73	4.08	.07	174.5000	6.0740	.27	518.	518.	518.
17.000	89.2680	1.4839	.18	209.34	4.12	-.14	148.6000	4.8560	.33	512.	512.	512.
18.000	75.9240	1.1331	.11	210.04	3.67	-.10	126.0000	3.5140	.31	509.	509.	509.
19.000	64.6180	.8966	.07	211.14	3.15	-.05	106.6000	2.5110	.23	504.	504.	504.
20.000	55.0450	.7310	.06	212.17	2.83	.19	90.4000	1.8330	.07	501.	501.	501.
21.000	46.9150	.6049	-.02	213.20	2.64	.31	76.6700	1.3090	-.17	484.	484.	484.
22.000	40.0290	.5278	.05	214.20	2.56	.47	65.1100	1.0490	-.18	482.	482.	482.
23.000	34.1950	.4669	.05	215.30	2.67	.76	55.3300	.8424	-.27	477.	477.	477.
24.000	29.2260	.4134	.04	216.44	2.95	.89	47.0500	.7189	-.36	476.	476.	476.
25.000	25.0080	.3765	.07	217.49	3.15	.81	40.0600	.5979	-.31	460.	460.	460.
26.000	21.4140	.3472	.12	218.56	3.34	.78	34.1400	.5153	-.26	448.	448.	448.
27.000	18.3470	.3255	.17	219.71	3.37	.69	29.0900	.4299	-.23	412.	412.	412.
28.000	15.7360	.3064	.18	220.83	3.38	.62	24.8300	.3788	-.17	387.	387.	387.
29.000	13.5100	.2833	.17	222.00	3.47	.78	21.2000	.3448	-.13	356.	356.	356.
30.000	11.6030	.2651	.19	223.04	3.38	.60	18.1200	.3131	-.02	316.	316.	316.
32.000	8.5984	.2835	.04	226.74	4.70	.37	13.2600	.3047	.48	100.	108.	93.
34.000	6.4034	.2205	.26	229.97	4.84	.19	9.7170	.2872	.27	99.	107.	97.
36.000	4.7833	.1780	.29	234.08	5.42	.18	7.1360	.2575	.31	99.	107.	97.
38.000	3.5966	.1400	.33	239.26	6.48	.94	5.2470	.2095	.22	98.	106.	88.
40.000	2.7203	.1099	.37	246.18	6.43	.22	3.8560	.1642	.61	97.	105.	97.
42.000	2.0748	.0871	.41	252.67	6.69	-.48	2.8660	.1295	.75	97.	105.	97.
44.000	1.5928	.0693	.46	258.36	6.64	-.63	2.1500	.0973	.69	96.	104.	96.
46.000	1.2294	.0552	.44	262.72	6.04	.17	1.6310	.0716	.54	98.	104.	98.
48.000	.9520	.0437	.40	265.16	6.09	.56	1.2510	.0548	.32	97.	104.	97.
50.000	.7388	.0360	.45	265.44	5.70	.44	.9698	.0446	.36	96.	101.	96.
52.000	.5730	.0290	.44	264.86	6.30	.13	.7543	.0356	.54	95.	100.	95.
54.000	.4436	.0230	.37	262.58	6.25	.33	.5889	.0294	.50	92.	97.	92.
56.000	.3440	.0183	.28	260.66	6.52	.02	.4591	.0239	.52	89.	92.	89.
58.000	.2642	.0140	.25	258.67	7.23	.21	.3553	.0178	.57	79.	82.	79.
60.000	.2029	.0114	.12	257.02	8.30	.11	.2751	.0149	.30	67.	71.	67.
62.000	.1551	.0099	.09	253.34	9.73	.20	.2138	.0136	.20	46.	50.	46.
64.000	.1198	.0082	-.11	252.16	11.68	.33	.1662	.0125	.04	35.	39.	35.
66.000	.0916	.0069	-.16	248.04	13.41	.33	.1285	.0098	.49	31.	33.	31.
68.000	.0694	.0059	-.02	244.32	18.12	.12	.0996	.0084	.98	28.	32.	28.
70.000	.0532	.0052	.06	233.26	21.56	.32	.0784	.0080	.79	18.	20.	18.

TABLE II-12. THERMODYNAMIC STATISTICAL PARAMETERS

DECEMBER

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1019.3000	9.0655	-.45	276.65	5.23	-.05	1281.0000	31.8800	.12	533.	533.	533.
.003	1019.0000	9.0564	-.46	276.65	5.22	-.05	1280.0000	31.8200	.12	534.	534.	534.
1.000	901.3100	7.6711	-.59	275.27	7.25	-.15	1139.0000	31.9900	.13	534.	534.	534.
2.000	795.9900	7.5912	-.56	272.73	6.29	-.54	1016.0000	20.9800	.27	534.	534.	534.
3.000	701.9100	7.9731	-.61	268.74	5.89	-.67	909.1000	15.1200	.29	534.	534.	534.
4.000	617.5100	8.3544	-.64	263.82	5.55	-.72	814.9000	10.9800	.21	534.	534.	534.
5.000	541.8900	8.6142	-.69	257.84	5.48	-.77	731.9000	8.9080	.09	534.	534.	534.
6.000	474.1200	8.6618	-.73	251.45	5.40	-.59	656.7000	7.6420	-.45	534.	534.	534.
7.000	413.2100	8.5177	-.72	244.70	5.21	-.42	588.2000	7.2390	-.76	534.	534.	534.
8.000	358.9100	8.2260	-.68	237.72	4.85	-.15	525.9000	7.6060	-.89	533.	533.	533.
9.000	310.3300	7.7773	-.56	230.77	4.28	.05	468.5000	8.7720	-1.36	532.	532.	532.
10.000	267.1400	7.0385	-.40	224.30	3.94	.17	415.0000	10.7300	-1.43	532.	532.	532.
11.000	229.1700	6.1196	-.21	219.20	4.37	.57	369.4000	12.6700	-1.07	531.	531.	531.
12.000	196.0900	5.0555	-.04	216.26	5.32	.36	316.2000	13.4000	-.44	527.	527.	527.
13.000	167.4600	4.0248	.07	215.03	5.21	-.18	271.6000	11.5000	.04	520.	520.	520.
14.000	142.9000	3.1568	.11	213.74	4.33	-.19	233.1000	8.7830	.13	516.	516.	516.
15.000	121.8100	2.4602	.14	211.87	4.23	-.22	200.4000	7.2470	.17	506.	506.	506.
16.000	103.7100	1.9195	.30	210.32	4.05	-.03	171.9000	5.8590	.16	500.	500.	500.
17.000	88.2120	1.4380	.17	209.74	4.00	-.19	146.6000	4.6680	.30	483.	483.	483.
18.000	75.0300	1.1055	.10	209.92	3.66	-.26	124.6000	3.4520	.33	467.	467.	467.
19.000	63.8510	.8799	.01	210.56	3.40	-.21	105.7000	2.5590	.26	480.	460.	480.
20.000	54.3630	.7129	-.09	211.38	3.19	-.27	89.6200	1.9220	.21	453.	453.	453.
21.000	46.3050	.5943	-.22	212.23	3.04	.23	76.0200	1.4160	-.01	436.	436.	436.
22.000	39.4710	.5185	-.22	213.02	3.10	.60	64.5600	1.1170	-.08	427.	427.	427.
23.000	33.6780	.4632	-.18	213.95	3.08	.86	54.8400	.8705	-.35	413.	413.	413.
24.000	28.7640	.4242	-.12	214.82	3.27	1.10	46.6500	.7555	-.40	418.	418.	418.
25.000	24.5760	.3912	.03	215.76	3.51	1.15	39.6900	.6475	-.28	404.	404.	404.
26.000	21.0180	.3651	.18	216.85	3.86	1.28	33.7700	.5832	-.50	392.	392.	392.
27.000	17.9940	.3367	.44	218.01	4.21	1.34	28.7600	.5145	-.59	358.	358.	358.
28.000	15.4100	.3177	.63	219.16	4.45	1.19	24.5000	.4533	-.43	344.	344.	344.
29.000	13.2150	.2957	.80	220.57	4.62	.89	20.8800	.3949	-.28	321.	321.	321.
30.000	11.3360	.2743	.82	222.21	4.77	.54	17.7700	.3597	-.22	284.	284.	284.
32.000	8.3947	.2290	.63	228.75	5.68	.44	12.8300	.3339	.04	69.	73.	60.
34.000	6.2727	.1850	.93	233.76	6.39	.16	9.3680	.2750	-.12	69.	74.	63.
36.000	4.7200	.1551	.68	239.06	6.40	-.26	6.8910	.2290	.39	68.	72.	67.
38.000	3.5736	.1220	.55	245.48	7.57	.26	5.0790	.1939	.73	69.	74.	69.
40.000	2.7242	.0981	.30	252.27	7.64	.09	3.7600	.1679	.79	69.	72.	69.
42.000	2.0890	.0810	.34	257.55	10.17	-.08	2.8240	.1392	.78	69.	71.	69.
44.000	1.6136	.0661	.44	262.47	11.10	-.29	2.1430	.1104	.46	69.	70.	69.
46.000	1.2512	.0553	.51	267.02	10.60	-.16	1.6350	.0778	.29	69.	73.	69.
48.000	.9730	.0477	.53	268.28	9.84	-.02	1.2620	.0538	.10	68.	68.	68.
50.000	.7572	.0410	.51	266.88	7.54	-.28	.9882	.0456	.33	67.	69.	67.
52.000	.5889	.0344	.49	265.89	7.29	.15	.7706	.0357	.20	66.	66.	66.
54.000	.4569	.0287	.52	262.71	7.25	.26	.6052	.0311	.27	63.	66.	63.
56.000	.3542	.0242	.47	260.55	6 73	.27	.4731	.0276	.44	59.	62.	59.
58.000	.2722	.0200	.60	257.12	6.64	.14	.3682	.0239	.45	52.	54.	52.
60.000	.2080	.0155	.66	253.28	8.48	.24	.2860	.0182	.30	46.	48.	46.
62.000	.1552	.0121	1.72	248.55	9.40	.94	.2176	.0130	.38	31.	33.	31.
64.000	.1184	.0105	1.87	244.51	10.09	.61	.1686	.0110	.47	29.	31.	29.
66.000	.0884	.0058	.29	240.90	10.66	-.27	.1279	.0072	-.07	27.	27.	27.
68.000	.0668	.0051	.38	238.28	14.89	-.07	.0978	.0057	.77	24.	24.	24.
70.000	.0515	.0047	-.03	233.63	21.77	.03	.0751	.0053	.89	13.	17.	13.

TABLE II-13. THERMODYNAMIC STATISTICAL PARAMETERS

ANNUAL

STATION = 724020 WALLOPS ISLAND

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1018.0000	7.3307	-.34	284.90	8.96	-.27	1240.0000	45.5800	.43	6447.	6447.	6447.
.003	1017.7000	7.3352	-.34	284.90	8.95	-.27	1240.0000	45.5000	.43	6473.	6473.	6473.
1.000	903.3300	6.7689	-.93	282.44	8.90	-.63	1111.0000	35.7900	.69	6471.	6471.	6471.
2.000	800.0700	7.6912	-.93	278.16	7.72	-.77	1000.0000	23.6800	.76	6469.	6469.	6469.
3.000	707.1600	8.6823	-.90	273.59	7.11	-.85	899.3000	16.2800	.84	6468.	6468.	6468.
4.000	623.5800	9.5124	-.88	268.40	6.95	-.85	808.7000	11.9700	.79	6466.	6466.	6466.
5.000	548.5600	10.1630	-.88	262.60	7.12	-.78	727.4000	9.4930	.61	6464.	6464.	6464.
6.000	481.1400	10.5420	-.85	256.25	7.31	-.66	653.9000	7.7080	.33	6455.	6455.	6455.
7.000	420.3400	10.7010	-.79	249.43	7.37	-.49	587.0000	6.4890	-.01	6435.	6435.	6435.
8.000	366.0900	10.7120	-.73	242.40	7.23	-.31	526.1000	6.2030	-.74	6415.	6415.	6415.
9.000	317.4600	10.5090	-.63	235.27	6.81	-.15	470.0000	7.2220	-1.86	6405.	6405.	6405.
10.000	274.0800	10.0300	-.49	228.41	6.04	-.05	418.0000	9.4190	-2.10	6398.	6398.	6398.
11.000	235.7400	9.2417	-.35	222.39	5.21	-.14	369.3000	12.0800	-1.65	6385.	6385.	6385.
12.000	202.0000	8.0786	-.23	217.87	4.73	-.12	323.1000	14.1100	-1.03	6354.	6354.	6354.
13.000	172.6700	6.8770	-.12	214.98	4.62	.16	280.0000	14.4400	-.50	6318.	6318.	6318.
14.000	147.3000	5.6241	-.06	212.96	4.52	.21	241.2000	12.9700	-.17	6284.	6284.	6284.
15.000	125.5000	4.5187	-.05	211.33	4.46	.10	207.1000	10.8200	-.03	6247.	6247.	6247.
16.000	106.8400	3.6428	-.04	210.40	4.16	.02	177.0000	8.4750	-.03	6216.	6216.	6216.
17.000	90.9330	2.9723	-.04	210.54	3.70	-.04	150.5000	6.3320	-.14	6136.	6136.	6136.
18.000	77.4180	2.4808	-.02	211.42	3.25	-.19	127.6000	4.6700	-.23	6070.	6070.	6070.
19.000	65.9780	2.1224	.00	212.81	3.00	-.32	108.0000	3.4850	-.26	6005.	6005.	6005.
20.000	56.2870	1.8491	.03	214.25	2.98	-.45	91.5200	2.7170	-.27	5953.	5953.	5953.
21.000	48.0860	1.6361	.03	215.73	3.15	-.42	77.6500	2.1860	-.26	5768.	5768.	5768.
22.000	41.0990	1.4571	.04	217.02	3.38	-.41	65.9600	1.8180	-.23	5644.	5644.	5644.
23.000	35.1830	1.3071	.03	218.34	3.56	-.42	56.1300	1.5410	-.20	5560.	5560.	5560.
24.000	30.1280	1.1801	.03	219.64	3.81	-.45	47.7700	1.3300	-.15	5529.	5529.	5529.
25.000	25.8580	1.0723	-.01	220.94	4.04	-.50	40.7600	1.1670	-.11	5481.	5481.	5481.
26.000	22.2000	.9725	-.02	222.27	4.25	-.51	34.7800	1.0450	-.09	5331.	5331.	5331.
27.000	19.0870	.8837	-.06	223.67	4.44	-.53	29.7200	.9408	-.08	4971.	4971.	4971.
28.000	16.4150	.8017	-.08	225.06	4.58	-.56	25.4000	.8572	-.10	4652.	4652.	4652.
29.000	14.1360	.7236	-.10	226.58	4.68	-.56	21.7200	.7877	-.13	4270.	4270.	4270.
30.000	12.1880	.6544	-.13	228.19	4.75	-.60	18.6000	.7292	-.16	3793.	3793.	3793.
32.000	9.0590	.5250	-.11	233.55	5.60	-.29	13.5300	.6194	-.19	1226.	1281.	1162.
34.000	6.8063	.4174	-.10	238.12	6.13	-.27	9.9590	.5105	-.25	1212.	1267.	1183.
36.000	5.1401	.3370	-.08	243.13	6.67	-.30	7.3690	.4159	-.27	1196.	1251.	1184.
38.000	3.9077	.2701	-.09	248.92	7.02	-.34	5.4710	.3350	-.25	1190.	1248.	1189.
40.000	2.9884	.2166	-.09	254.77	7.17	-.26	4.0870	.2672	-.22	1185.	1242.	1185.
42.000	2.2994	.1740	-.10	260.02	7.26	-.32	3.0800	.2109	-.21	1182.	1232.	1182.
44.000	1.7794	.1402	-.10	264.69	7.17	-.39	2.3390	.1651	-.20	1179.	1207.	1179.
46.000	1.3816	.1132	-.08	267.78	6.55	-.24	1.7950	.1314	-.16	1174.	1187.	1174.
48.000	1.0755	.0914	-.07	268.65	6.20	-.15	1.3920	.1060	-.14	1159.	1166.	1159.
50.000	.8375	.0738	-.07	267.88	6.02	-.14	1.0870	.0855	-.14	1143.	1148.	1143.
52.000	.6515	.0593	-.04	266.19	6.38	-.16	.8507	.0698	-.12	1119.	1137.	1119.
54.000	.5053	.0475	.00	263.84	6.44	-.24	.6662	.0571	-.09	1080.	1126.	1080.
56.000	.3910	.0377	.03	261.00	6.73	-.15	.5212	.0469	-.08	1009.	1063.	1009.
58.000	.3022	.0300	.07	257.80	7.22	.01	.4081	.0386	-.06	904.	962.	904.
60.000	.2316	.0234	.07	253.76	8.10	.13	.3178	.0313	-.11	747.	797.	747.
62.000	.1760	.0175	-.06	248.61	8.94	.37	.2469	.0245	-.24	555.	606.	555.
64.000	.1328	.0129	-.03	242.92	10.19	.67	.1909	.0193	-.21	442.	489.	442.
66.000	.1002	.0097	-.01	237.20	11.24	.90	.1474	.0152	-.18	393.	430.	393.
68.000	.0751	.0073	.01	231.44	13.75	1.12	.1135	.0117	-.13	345.	381.	345.
70.000	.0566	.0056	-.01	223.04	16.41	1.06	.0884	.0097	-.15	214.	268.	214.

TABLE III-1. MOISTURE RELATED STATISTICAL PARAMETERS

JANUARY

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	5.426	2.885	.68	274.31	5.84	-.05	269.77	7.50	-.13	516.	518.
.003	5.427	2.882	.68	274.30	5.83	-.05	269.77	7.49	-.13	517.	517.
1.000	4.160	3.387	1.13	273.37	8.14	-.07	264.15	10.77	.13	515.	517.
2.000	2.900	2.478	1.15	270.75	7.26	-.49	259.36	10.66	.19	516.	517.
3.000	1.892	1.630	1.38	266.98	6.58	-.70	254.47	9.83	.23	516.	517.
4.000	1.222	1.044	1.41	261.88	6.35	-.81	249.49	9.43	.12	517.	517.
5.000	.766	.667	1.37	255.94	6.15	-.86	244.18	9.37	.04	517.	517.
6.000	.437	.383	1.52	249.35	6.13	-.80	238.49	8.66	.09	506.	516.
7.000	.258	.205	1.28	242.55	5.71	-.62	233.73	7.79	-.07	457.	516.
8.000	.148	.097	.97	235.64	5.09	-.42	229.21	6.42	-.35	325.	514.
9.000	.102	.046	.46	228.96	4.20	-.31	226.82	4.28	-.24	56.	513.
10.000	99.999	99.999	999.99	223.03	3.67	-.02	999.99	99.99	999.99	0.	513.
11.000	99.999	99.999	999.99	218.58	4.71	.58	999.99	99.99	999.99	0.	512.
12.000	99.999	99.999	999.99	216.59	5.90	.15	999.99	99.99	999.99	0.	502.
13.000	99.999	99.999	999.99	216.12	5.22	-.24	999.99	99.99	999.99	0.	499.
14.000	99.999	99.999	999.99	214.96	4.10	.01	999.99	99.99	999.99	0.	494.
15.000	99.999	99.999	999.99	213.03	3.84	.00	999.99	99.99	999.99	0.	486.
16.000	99.999	99.999	999.99	211.30	3.82	.03	999.99	99.99	999.99	0.	482.
17.000	99.999	99.999	999.99	210.42	3.88	.03	999.99	99.99	999.99	0.	464.
18.000	99.999	99.999	999.99	210.36	3.70	.00	999.99	99.99	999.99	0.	456.
19.000	99.999	99.999	999.99	211.06	3.31	.32	999.99	99.99	999.99	0.	445.
20.000	99.999	99.999	999.99	212.14	3.25	.53	999.99	99.99	999.99	0.	438.
21.000	99.999	99.999	999.99	213.24	3.47	1.02	999.99	99.99	999.99	0.	421.
22.000	99.999	99.999	999.99	214.23	3.74	1.24	999.99	99.99	999.99	0.	417.
23.000	99.999	99.999	999.99	215.36	3.98	1.16	999.99	99.99	999.99	0.	411.
24.000	99.999	99.999	999.99	216.37	4.15	.94	999.99	99.99	999.99	0.	419.
25.000	99.999	99.999	999.99	217.32	4.26	.84	999.99	99.99	999.99	0.	406.
26.000	99.999	99.999	999.99	218.42	4.19	.59	999.99	99.99	999.99	0.	394.
27.000	99.999	99.999	999.99	219.34	4.13	.48	999.99	99.99	999.99	0.	361.
28.000	99.999	99.999	999.99	220.62	4.26	.45	999.99	99.99	999.99	0.	336.
29.000	99.999	99.999	999.99	222.21	4.43	.48	999.99	99.99	999.99	0.	303.
30.000	99.999	99.999	999.99	223.99	4.71	.30	999.99	99.99	999.99	0.	266.

TABLE III-2. MOISTURE RELATED STATISTICAL PARAMETERS

FEBRUARY

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	5.200	2.620	.68	274.28	5.57	.05	269.33	7.25	-.31	482.	482.
.003	5.200	2.620	.68	274.27	5.57	.05	269.33	7.25	-.31	482.	482.
1.000	3.730	2.907	1.37	272.57	7.71	.03	263.22	10.03	.02	482.	482.
2.000	2.628	2.143	1.28	269.43	6.73	-.23	258.58	10.01	.12	482.	482.
3.000	1.716	1.442	1.45	265.33	6.35	-.44	253.48	9.58	.12	482.	482.
4.000	1.042	.879	1.58	260.14	5.94	-.47	247.97	8.85	.20	482.	482.
5.000	.636	.549	1.61	254.03	5.97	-.49	242.55	8.61	.19	481.	482.
6.000	.386	.338	1.68	247.58	5.82	-.36	237.25	8.59	.07	473.	482.
7.000	.225	.177	1.54	240.85	5.55	-.11	232.54	7.48	-.08	407.	482.
8.000	.143	.090	1.09	234.09	5.08	.15	229.02	6.26	-.48	230.	479.
9.000	.094	.047	-.01	227.68	4.66	.32	225.11	7.26	-1.66	34.	479.
10.000	99.999	99.999	999.99	222.35	4.65	.51	999.99	99.99	999.99	4.	478.
11.000	99.999	99.999	999.99	219.22	5.52	.48	999.99	99.99	999.99	2.	478.
12.000	99.999	99.999	999.99	218.46	6.06	-.22	999.99	99.99	999.99	0.	474.
13.000	99.999	99.999	999.99	218.14	5.06	-.74	999.99	99.99	999.99	0.	469.
14.000	99.999	99.999	999.99	216.77	3.94	-.41	999.99	99.99	999.99	0.	464.
15.000	99.999	99.999	999.99	214.85	3.80	.02	999.99	99.99	999.99	0.	460.
16.000	99.999	99.999	999.99	213.02	3.78	.08	999.99	99.99	999.99	0.	458.
17.000	99.999	99.999	999.99	212.07	3.74	.02	999.99	99.99	999.99	0.	449.
18.000	99.999	99.999	999.99	212.07	3.58	-.12	999.99	99.99	999.99	0.	443.
19.000	99.999	99.999	999.99	212.64	3.36	.12	999.99	99.99	999.99	0.	438.
20.000	99.999	99.999	999.99	213.30	3.03	.16	999.99	99.99	999.99	0.	434.
21.000	99.999	99.999	999.99	213.99	2.92	.24	999.99	99.99	999.99	0.	412.
22.000	99.999	99.999	999.99	214.85	3.00	.11	999.99	99.99	999.99	0.	407.
23.000	99.999	99.999	999.99	215.67	2.93	-.07	999.99	99.99	999.99	0.	398.
24.000	99.999	99.999	999.99	216.75	2.96	-.02	999.99	99.99	999.99	0.	401.
25.000	99.999	99.999	999.99	217.73	3.03	-.23	999.99	99.99	999.99	0.	393.
26.000	99.999	99.999	999.99	218.87	3.18	-.08	999.99	99.99	999.99	0.	386.
27.000	99.999	99.999	999.99	219.97	3.27	.04	999.99	99.99	999.99	0.	357.
28.000	99.999	99.999	999.99	221.30	3.43	-.10	999.99	99.99	999.99	0.	330.
29.000	99.999	99.999	999.99	223.06	3.74	.21	999.99	99.99	999.99	0.	296.
30.000	99.999	99.999	999.99	224.97	3.92	.52	999.99	99.99	999.99	0.	261.

TABLE III-3. MOISTURE RELATED STATISTICAL PARAMETERS

MARCH

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	7.042	2.960	.50	278.40	4.60	.02	273.94	6.30	-.42	527.	527.
.003	7.045	2.959	.50	278.40	4.60	.01	273.95	6.30	-.42	528.	528.
1.000	4.972	3.419	.89	276.87	7.58	-.09	267.40	9.67	-.06	527.	528.
2.000	3.409	2.454	.69	273.06	6.91	-.45	261.97	10.36	-.17	527.	528.
3.000	2.227	1.750	.95	268.48	6.20	-.70	256.50	10.11	-.01	527.	528.
4.000	1.340	1.118	1.32	262.91	5.97	-.79	250.56	9.55	.06	528.	528.
5.000	.767	.687	1.56	256.68	5.81	-.76	244.19	9.27	.14	528.	528.
6.000	.426	.407	1.94	250.01	5.73	-.63	237.96	8.90	.15	523.	527.
7.000	.238	.211	1.97	242.91	5.54	-.34	232.77	7.91	-.03	471.	527.
8.000	.141	.104	1.63	235.81	5.02	-.10	228.60	6.63	-.28	333.	527.
9.000	.115	.055	.24	228.98	4.33	.05	227.53	5.40	-1.11	58.	526.
10.000	99.999	99.999	999.99	223.10	3.85	.21	999.99	99.99	999.99	1.	525.
11.000	99.999	99.999	999.99	218.72	5.03	.65	999.99	99.99	999.99	1.	524.
12.000	99.999	99.999	999.99	216.90	6.26	.25	999.99	99.99	999.99	0.	520.
13.000	99.999	99.999	999.99	217.22	5.25	-.29	999.99	99.99	999.99	0.	516.
14.000	99.999	99.999	999.99	216.40	4.09	-.24	999.99	99.99	999.99	0.	511.
15.000	99.999	99.999	999.99	214.67	3.77	-.06	999.99	99.99	999.99	0.	508.
16.000	99.999	99.999	999.99	213.20	3.76	-.05	999.99	99.99	999.99	0.	505.
17.000	99.999	99.999	999.99	212.62	3.67	-.10	999.99	99.99	999.99	0.	499.
18.000	99.999	99.999	999.99	212.56	3.50	-.12	999.99	99.99	999.99	0.	494.
19.000	99.999	99.999	999.99	213.01	3.12	-.16	999.99	99.99	999.99	0.	488.
20.000	99.999	99.999	999.99	213.88	2.97	-.28	999.99	99.99	999.99	0.	487.
21.000	99.999	99.999	999.99	214.87	2.99	-.12	999.99	99.99	999.99	0.	468.
22.000	99.999	99.999	999.99	215.86	3.11	.23	999.99	99.99	999.99	0.	462.
23.000	99.999	99.999	999.99	216.90	3.03	.28	999.99	99.99	999.99	0.	456.
24.000	99.999	99.999	999.99	217.85	2.96	.12	999.99	99.99	999.99	0.	454.
25.000	99.999	99.999	999.99	218.70	2.92	.00	999.99	99.99	999.99	0.	442.
26.000	99.999	99.999	999.99	219.89	2.96	.02	999.99	99.99	999.99	0.	428.
27.000	99.999	99.999	999.99	221.22	3.18	.16	999.99	99.99	999.99	0.	393.
28.000	99.999	99.999	999.99	222.74	3.38	.53	999.99	99.99	999.99	0.	359.
29.000	99.999	99.999	999.99	224.55	3.56	.56	999.99	99.99	999.99	0.	334.
30.000	99.999	99.999	999.99	226.61	3.64	.56	999.99	99.99	999.99	0.	301.

TABLE III-4. MOISTURE RELATED STATISTICAL PARAMETERS

APRIL

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	9.579	3.394	.29	283.66	4.54	.43	278.62	5.55	-.56	527.	527.
.003	9.583	3.421	.29	283.65	4.55	.42	278.61	5.60	-.56	533.	533.
1.000	6.142	3.577	.75	281.57	6.56	-.18	271.11	8.22	-.02	529.	533.
2.000	4.194	2.662	.68	276.46	5.96	-.42	265.51	9.04	-.20	527.	533.
3.000	2.636	1.862	.82	271.22	5.12	-.64	259.23	9.20	.00	527.	533.
4.000	1.528	1.169	1.12	265.68	4.83	-.75	252.59	8.82	.17	528.	533.
5.000	.864	.709	1.47	259.51	4.84	-.71	246.08	8.41	.29	527.	533.
6.000	.460	.391	1.78	252.86	4.95	-.71	239.46	7.91	.28	524.	532.
7.000	.248	.209	1.77	245.89	5.00	-.59	233.36	7.53	.19	513.	532.
8.000	.134	.101	1.76	238.82	4.71	-.32	228.09	6.55	-.05	437.	532.
9.000	.090	.054	1.28	231.62	4.25	-.26	224.83	6.34	-1.08	126.	531.
10.000	99.999	99.999	999.99	224.98	3.61	-.16	999.99	99.99	999.99	0.	531.
11.000	99.999	99.999	999.99	219.50	3.81	.64	999.99	99.99	999.99	0.	528.
12.000	99.999	99.999	999.99	216.23	5.25	.60	999.99	99.99	999.99	0.	526.
13.000	99.999	99.999	999.99	215.45	5.85	-.12	999.99	99.99	999.99	0.	525.
14.000	99.999	99.999	999.99	215.32	4.70	-.68	999.99	99.99	999.99	0.	524.
15.000	99.999	99.999	999.99	214.48	3.63	-.31	999.99	99.99	999.99	0.	524.
16.000	99.999	99.999	999.99	213.31	3.23	-.18	999.99	99.99	999.99	0.	521.
17.000	99.999	99.999	999.99	212.67	3.17	-.04	999.99	99.99	999.99	0.	513.
18.000	99.999	99.999	999.99	212.48	3.09	-.05	999.99	99.99	999.99	0.	505.
19.000	99.999	99.999	999.99	213.11	2.90	.08	999.99	99.99	999.99	0.	501.
20.000	99.999	99.999	999.99	214.29	2.63	.16	999.99	99.99	999.99	0.	497.
21.000	99.999	99.999	999.99	215.82	2.67	.25	999.99	99.99	999.99	0.	480.
22.000	99.999	99.999	999.99	217.12	2.73	.29	999.99	99.99	999.99	0.	465.
23.000	99.999	99.999	999.99	218.37	2.73	.28	999.99	99.99	999.99	0.	461.
24.000	99.999	99.999	999.99	219.68	2.79	.22	999.99	99.99	999.99	0.	454.
25.000	99.999	99.999	999.99	220.91	2.80	.09	999.99	99.99	999.99	0.	445.
26.000	99.999	99.999	999.99	222.32	2.94	-.01	999.99	99.99	999.99	0.	432.
27.000	99.999	99.999	999.99	223.76	2.92	-.30	999.99	99.99	999.99	0.	400.
28.000	99.999	99.999	999.99	225.36	2.94	-.46	999.99	99.99	999.99	0.	378.
29.000	99.999	99.999	999.99	227.05	2.81	-.41	999.99	99.99	999.99	0.	336.
30.000	99.999	99.999	999.99	228.99	2.92	-.26	999.99	99.99	999.99	0.	303.

TABLE III-5. MOISTURE RELATED STATISTICAL PARAMETERS

MAY

STATION = 724020 HALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	14.174	3.739	-.05	289.48	4.10	.24	284.80	4.35	-.78	540.	540.
.003	14.141	3.765	-.06	289.46	4.08	.25	284.75	4.40	-.78	550.	550.
1.000	8.779	3.880	.33	286.47	4.96	-.37	276.86	6.93	-.44	541.	548.
2.000	5.678	2.928	.24	280.94	4.44	-.69	270.21	8.12	-.49	540.	547.
3.000	3.395	2.014	.46	275.48	3.94	-.98	263.06	8.39	-.20	539.	546.
4.000	1.954	1.336	1.01	269.91	3.71	-1.14	256.03	8.14	.16	539.	546.
5.000	1.115	.799	1.29	263.94	3.93	-1.16	249.53	7.68	.23	539.	546.
6.000	.614	.460	1.58	257.38	4.18	-1.09	242.98	7.33	.24	539.	546.
7.000	.330	.250	1.64	250.28	4.42	-.97	236.57	7.12	.08	535.	546.
8.000	.168	.125	1.77	242.94	4.39	-.74	230.23	6.60	-.15	514.	545.
9.000	.096	.057	1.40	235.40	4.10	-.49	225.87	5.07	-.10	302.	544.
10.000	.065	.040	1.01	227.97	3.50	-.28	222.54	4.71	.70	13.	543.
11.000	99.999	99.999	999.99	221.13	3.18	.08	999.99	99.99	999.99	0.	542.
12.000	99.999	99.999	999.99	215.64	3.94	.95	999.99	99.99	999.99	0.	540.
13.000	99.999	99.999	999.99	212.78	5.11	.61	999.99	99.99	999.99	0.	540.
14.000	99.999	99.999	999.99	212.81	4.74	.06	999.99	99.99	999.99	0.	539.
15.000	99.999	99.999	999.99	213.07	3.59	.00	999.99	99.99	999.99	0.	535.
16.000	99.999	99.999	999.99	212.53	3.27	-.01	999.99	99.99	999.99	0.	534.
17.000	99.999	99.999	999.99	212.27	3.03	.05	999.99	99.99	999.99	0.	532.
18.000	99.999	99.999	999.99	212.76	2.73	.09	999.99	99.99	999.99	0.	530.
19.000	99.999	99.999	999.99	213.97	2.49	.05	999.99	99.99	999.99	0.	526.
20.000	99.999	99.999	999.99	215.50	2.25	.03	999.99	99.99	999.99	0.	521.
21.000	99.999	99.999	999.99	217.27	2.14	.01	999.99	99.99	999.99	0.	501.
22.000	99.999	99.999	999.99	218.77	2.00	.17	999.99	99.99	999.99	0.	497.
23.000	99.999	99.999	999.99	220.13	1.85	.24	999.99	99.99	999.99	0.	485.
24.000	99.999	99.999	999.99	221.54	1.77	.37	999.99	99.99	999.99	0.	476.
25.000	99.999	99.999	999.99	222.93	1.71	.32	999.99	99.99	999.99	0.	474.
26.000	99.999	99.999	999.99	224.45	1.80	.24	999.99	99.99	999.99	0.	459.
27.000	99.999	99.999	999.99	226.02	1.86	.14	999.99	99.99	999.99	0.	425.
28.000	99.999	99.999	999.99	227.75	1.88	.25	999.99	99.99	999.99	0.	394.
29.000	99.999	99.999	999.99	229.56	2.00	.29	999.99	99.99	999.99	0.	358.
30.000	99.999	99.999	999.99	231.38	2.01	-.01	999.99	99.99	999.99	0.	319.

TABLE III-6. MOISTURE RELATED STATISTICAL PARAMETERS

JUNE

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	19.639	3.984	-.28	294.73	3.39	-.22	290.05	3.45	-.87	523.	523.
.003	19.636	3.980	-.28	294.72	3.38	-.23	290.05	3.45	-.87	524.	524.
1.000	11.941	4.132	-.18	291.0:	3.82	-.70	281.79	5.96	-.90	523.	524.
2.000	7.520	3.295	-.13	284.95	3.47	-.95	274.46	7.61	-.91	523.	524.
3.000	4.240	2.307	.33	279.32	3.07	-1.43	266.21	8.10	-.37	523.	524.
4.000	2.432	1.568	.86	273.87	2.83	-1.70	258.83	6.10	.04	523.	524.
5.000	1.395	.974	1.44	268.19	2.78	-1.76	252.26	7.48	.28	523.	524.
6.000	.780	.585	1.77	261.93	2.94	-1.30	245.73	7.07	.43	523.	524.
7.000	.431	.318	1.81	255.19	3.19	-1.17	239.55	6.71	.23	522.	523.
8.000	.234	.165	1.79	248.11	3.32	-.94	233.65	6.20	.11	519.	523.
9.000	.116	.076	1.92	240.64	3.30	-.65	227.40	5.53	-.26	482.	522.
10.000	.070	.040	.92	232.96	3.12	-.43	223.00	5.33	-.53	128.	520.
11.000	99.999	99.999	999.99	225.34	2.89	-.35	999.99	99.99	999.99	0.	520.
12.000	99.999	99.999	999.99	218.21	2.65	.07	999.99	99.99	999.99	0.	519.
13.000	99.999	99.999	999.99	212.94	3.21	.81	999.99	99.99	999.99	0.	516.
14.000	99.999	99.999	999.99	210.74	3.90	.41	999.99	99.99	999.99	0.	514.
15.000	99.999	99.999	999.99	210.11	3.74	-.05	999.99	99.99	999.99	0.	513.
16.000	99.999	99.999	999.99	209.95	3.31	-.21	999.99	99.99	999.99	0.	512.
17.000	99.999	99.999	999.99	210.57	2.85	.01	999.99	99.99	999.99	0.	511.
18.000	99.999	99.999	999.99	211.86	2.51	.08	999.99	99.99	999.99	0.	509.
19.000	99.999	99.999	999.99	213.78	2.10	-.23	999.99	99.99	999.99	0.	507.
20.000	99.999	99.999	999.99	215.65	1.82	-.10	999.99	99.99	999.99	0.	500.
21.000	99.999	99.999	999.99	217.55	1.66	.03	999.99	99.99	999.99	0.	490.
22.000	99.999	99.999	999.99	219.36	1.57	.04	999.99	99.99	999.99	0.	475.
23.000	99.999	99.999	999.99	221.07	1.52	.22	999.99	99.99	999.99	0.	472.
24.000	99.999	99.999	999.99	222.78	1.52	.03	999.99	99.99	999.99	0.	465.
25.000	99.999	99.999	999.99	224.41	1.57	-.03	999.99	99.99	999.99	0.	472.
26.000	99.999	99.999	999.99	226.01	1.65	-.27	999.99	99.99	999.99	0.	464.
27.000	99.999	99.999	999.99	227.68	1.73	-.38	999.99	99.99	999.99	0.	451.
28.000	99.999	99.999	999.99	229.49	1.64	-.12	999.99	99.99	999.99	0.	435.
29.000	99.999	99.999	999.99	231.25	1.80	-.20	999.99	99.99	999.99	0.	401.
30.000	99.999	99.999	999.99	232.96	1.75	-.40	999.99	99.99	999.99	0.	363.

TABLE III-7. MOISTURE RELATED STATISTICAL PARAMETERS

JULY

STATION = 724020		WALLOPS ISLAND									
Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	23.157	4.091	-.37	298.03	3.08	.37	292.76	3.04	-.86	567.	567.
.003	23.148	4.086	-.37	298.02	3.08	.36	292.75	3.04	-.86	568.	568.
1.000	13.936	4.268	-.18	293.49	3.17	-.26	284.40	5.19	-.83	567.	568.
2.000	8.888	3.390	-.26	287.05	2.77	-.53	277.23	6.63	-.97	567.	568.
3.000	5.271	2.639	.13	281.38	2.15	-.40	269.30	7.87	-.50	566.	568.
4.000	3.234	1.883	.46	275.78	1.89	-.27	262.57	8.10	-.18	567.	568.
5.000	1.890	1.248	.83	270.11	1.94	-.50	255.73	7.98	.13	567.	568.
6.000	1.064	.755	1.13	264.15	2.20	-.57	248.97	7.77	.15	568.	568.
7.000	.577	.413	1.38	257.62	2.51	-.60	242.47	7.08	.22	567.	568.
8.000	.306	.206	1.35	250.65	2.76	-.64	236.28	6.38	.07	566.	568.
9.000	.153	.094	1.35	243.29	2.89	-.73	229.89	5.69	-.17	552.	567.
10.000	.074	.044	1.42	235.66	2.82	-.68	223.50	5.44	-.61	289.	567.
11.000	99.999	99.999	999.99	228.00	2.58	-.33	999.99	99.99	999.99	4.	566.
12.000	99.999	99.999	999.99	220.70	2.37	.00	999.99	99.99	999.99	0.	565.
13.000	99.999	99.999	999.99	214.81	2.62	.40	999.99	99.99	999.99	0.	563.
14.000	99.999	99.999	999.99	210.84	3.17	.35	999.99	99.99	999.99	0.	561.
15.000	99.999	99.999	999.99	208.55	3.57	.23	999.99	99.99	999.99	0.	560.
16.000	99.999	99.999	999.99	208.55	3.34	.00	999.99	99.99	999.99	0.	560.
17.000	99.999	99.999	999.99	210.15	2.62	-.06	999.99	99.99	999.99	0.	557.
18.000	99.999	99.999	999.99	212.05	2.08	-.03	999.99	99.99	999.99	0.	552.
19.000	99.999	99.999	999.99	214.24	1.86	.11	999.99	99.99	999.99	0.	539.
20.000	99.999	99.999	999.99	216.26	1.72	.05	999.99	99.99	999.99	0.	536.
21.000	99.999	99.999	999.99	218.23	1.64	-.16	999.99	99.99	999.99	0.	530.
22.000	99.999	99.999	999.99	219.93	1.59	.04	999.99	99.99	999.99	0.	509.
23.000	99.999	99.999	999.99	221.64	1.50	-.04	999.99	99.99	999.99	0.	500.
24.000	99.999	99.999	999.99	223.36	1.49	.14	999.99	99.99	999.99	0.	495.
25.000	99.999	99.999	999.99	224.96	1.54	.25	999.99	99.99	999.99	0.	501.
26.000	99.999	99.999	999.99	226.53	1.58	.44	999.99	99.99	999.99	0.	492.
27.000	99.999	99.999	999.99	228.08	1.70	.37	999.99	99.99	999.99	0.	473.
28.000	99.999	99.999	999.99	229.48	1.63	-.16	999.99	99.99	999.99	0.	430.
29.000	99.999	99.999	999.99	231.00	1.79	-.25	999.99	99.99	999.99	0.	407.
30.000	99.999	99.999	999.99	232.64	1.94	-.28	999.99	99.99	999.99	0.	349.

TABLE III-8. MOISTURE RELATED STATISTICAL PARAMETERS

AUGUST

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	23.411	4.623	-.36	297.86	3.47	-.20	292.87	3.44	-.86	586.	586.
.003	23.419	4.623	-.36	297.86	3.47	-.21	292.88	3.44	-.86	588.	589.
1.000	14.365	4.194	-.35	293.24	3.29	-.66	284.83	5.12	-1.09	587.	589.
2.000	8.960	3.636	-.30	287.14	2.57	-.71	277.12	7.35	-1.11	587.	588.
3.000	5.217	2.686	.11	281.67	1.97	-.65	269.03	8.16	-.51	587.	588.
4.000	3.131	1.904	.52	276.17	1.72	-.45	261.99	8.37	-.13	584.	587.
5.000	1.825	1.260	.93	270.56	1.66	-.28	255.17	8.13	.21	584.	586.
6.000	1.025	.717	1.27	264.53	1.77	-.23	248.71	7.41	.26	580.	581.
7.000	.576	.400	1.48	257.96	2.04	-.38	242.81	6.79	.25	562.	564.
8.000	.311	.208	1.41	251.00	2.23	-.42	236.44	6.36	.07	558.	559.
9.000	.155	.097	1.32	243.64	2.30	-.47	229.94	5.83	-.21	557.	559.
10.000	.075	.043	1.15	235.91	2.32	-.44	223.59	5.33	-.58	289.	558.
11.000	99.999	99.999	999.99	228.11	2.20	-.25	999.99	99.99	999.99	0.	557.
12.000	99.999	99.999	999.99	220.59	2.11	.09	999.99	99.99	999.99	0.	557.
13.000	99.999	99.999	999.99	214.35	2.38	.26	999.99	99.99	999.99	0.	551.
14.000	99.999	99.999	999.99	210.15	2.83	.45	999.99	99.99	999.99	0.	547.
15.000	99.999	99.999	999.99	208.04	3.04	.14	999.99	99.99	999.99	0.	547.
16.000	99.999	99.999	999.99	208.01	2.78	-.17	999.99	99.99	999.99	0.	546.
17.000	99.999	99.999	999.99	209.55	2.41	.15	999.99	99.99	999.99	0.	544.
18.000	99.999	99.999	999.99	211.73	2.10	.04	999.99	99.99	999.99	0.	542.
19.000	99.999	99.999	999.99	214.13	1.88	.25	999.99	99.99	999.99	0.	540.
20.000	99.999	99.999	999.99	216.07	1.69	.26	999.99	99.99	999.99	0.	538.
21.000	99.999	99.999	999.99	217.95	1.59	.15	999.99	99.99	999.99	0.	534.
22.000	99.999	99.999	999.99	219.65	1.51	.45	999.99	99.99	999.99	0.	509.
23.000	99.999	99.999	999.99	221.26	1.54	.06	999.99	99.99	999.99	0.	504.
24.000	99.999	99.999	999.99	222.92	1.45	.14	999.99	99.99	999.99	0.	501.
25.000	99.999	99.999	999.99	224.42	1.44	.01	999.99	99.99	999.99	0.	509.
26.000	99.999	99.999	999.99	225.87	1.48	.03	999.99	99.99	999.99	0.	496.
27.000	99.999	99.999	999.99	227.34	1.59	-.08	999.99	99.99	999.99	0.	477.
28.000	99.999	99.999	999.99	228.70	1.58	-.05	999.99	99.99	999.99	0.	446.
29.000	99.999	99.999	999.99	230.09	1.62	-.14	999.99	99.99	999.99	0.	412.
30.000	99.999	99.999	999.99	231.44	1.68	-.52	999.99	99.99	999.99	0.	369.

TABLE III-9. MOISTURE RELATED STATISTICAL PARAMETERS

SEPTEMBER

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	19.195	5.175	-.05	294.40	4.40	-.42	289.46	4.55	-.55	544.	544.
.003	19.188	5.171	-.05	294.39	4.40	-.42	289.45	4.54	-.55	544.	544.
1.000	11.831	4.634	-.05	290.05	4.01	-.49	281.38	6.73	-.77	544.	544.
2.000	7.146	3.710	.09	284.97	3.17	-.79	273.22	8.62	-.52	544.	544.
3.000	4.220	2.484	.52	279.99	2.59	-.97	266.00	8.18	-.02	544.	544.
4.000	2.593	1.722	.92	274.75	2.32	-.75	259.62	7.97	.33	542.	544.
5.000	1.563	1.138	1.21	269.03	2.41	-.50	253.37	7.80	.50	541.	543.
6.000	.902	.698	1.45	262.78	2.77	-.58	247.05	7.52	.56	542.	543.
7.000	.499	.387	1.64	255.94	3.01	-.57	240.86	6.98	.51	540.	543.
8.000	.267	.202	1.70	248.82	3.21	-.53	234.64	6.67	.24	537.	540.
9.000	.134	.093	1.57	241.32	3.28	-.48	228.40	6.06	-.07	507.	538.
10.000	.073	.046	1.35	233.73	3.09	-.38	223.28	5.30	-.04	201.	538.
11.000	99.999	99.999	999.99	226.38	2.78	-.26	999.99	99.99	999.99	1.	536.
12.000	99.999	99.999	999.99	219.77	2.59	.10	999.99	99.99	999.99	0.	536.
13.000	99.999	99.999	999.99	214.51	2.79	.36	999.99	99.99	999.99	0.	534.
14.000	99.999	99.999	999.99	210.50	3.04	.48	999.99	99.99	999.99	0.	534.
15.000	99.999	99.999	999.99	207.84	3.36	.32	999.99	99.99	999.99	0.	533.
16.000	99.999	99.999	999.99	207.04	3.05	.15	999.99	99.99	999.99	0.	530.
17.000	99.999	99.999	999.99	208.18	3.41	.07	999.99	99.99	999.99	0.	528.
18.000	99.999	99.999	999.99	210.36	2.95	.18	999.99	99.99	999.99	0.	526.
19.000	99.999	99.999	999.99	212.91	2.50	.33	999.99	99.99	999.99	0.	525.
20.000	99.999	99.999	999.99	215.11	2.15	.29	999.99	99.99	999.99	0.	519.
21.000	99.999	99.999	999.99	217.15	1.87	.20	999.99	99.99	999.99	0.	505.
22.000	99.999	99.999	999.99	218.72	1.74	.08	999.99	99.99	999.99	0.	493.
23.000	99.999	99.999	999.99	220.31	1.63	.00	999.99	99.99	999.99	0.	488.
24.000	99.999	99.999	999.99	221.88	1.63	-.01	999.99	99.99	999.99	0.	478.
25.000	99.999	99.999	999.99	223.39	1.60	-.03	999.99	99.99	999.99	0.	484.
26.000	99.999	99.999	999.99	224.86	1.57	.09	999.99	99.99	999.99	0.	465.
27.000	99.999	99.999	999.99	226.20	1.65	.36	999.99	99.99	999.99	0.	429.
28.000	99.999	99.999	999.99	227.48	1.69	.45	999.99	99.99	999.99	0.	406.
29.000	99.999	99.999	999.99	228.51	1.71	.25	999.99	99.99	999.99	0.	373.
30.000	99.999	99.999	999.99	229.71	1.78	.05	999.99	99.99	999.99	0.	330.

TABLE III-10. MOISTURE RELATED STATISTICAL PARAMETERS

OCTOBER

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	13.109	5.158	.27	287.69	5.79	-.34	283.02	6.34	-.36	565.	565.
.003	13.104	5.151	.27	287.67	5.78	-.34	283.01	6.33	-.36	566.	567.
1.000	7.863	4.276	.56	284.06	5.55	-.47	274.62	8.41	-.35	564.	567.
2.000	4.766	3.246	.77	280.11	4.87	-.89	266.91	9.49	.00	566.	567.
3.000	2.903	2.129	1.23	275.80	4.22	-1.04	260.66	8.64	.34	566.	567.
4.000	1.795	1.396	1.65	270.68	4.15	-1.18	254.89	8.02	.51	566.	567.
5.000	1.070	.902	2.01	264.86	4.23	-1.17	248.77	7.87	.52	566.	567.
6.000	.613	.560	2.46	258.28	4.33	-1.06	242.65	7.47	.63	566.	567.
7.000	.348	.320	2.38	251.15	4.36	-.82	236.75	7.33	.54	565.	566.
8.000	.184	.167	2.40	243.85	4.25	-.39	230.77	6.77	.53	542.	562.
9.000	.108	.088	1.80	236.42	3.95	-.03	225.95	6.64	.09	348.	561.
10.000	.068	.046	.73	229.18	3.69	.10	222.00	7.09	-.81	49.	561.
11.000	99.999	99.999	999.99	222.77	3.54	.26	999.99	99.99	999.99	0.	561.
12.000	99.999	99.999	999.99	217.80	3.68	.24	999.99	99.99	999.99	0.	560.
13.000	99.999	99.999	999.99	214.35	3.66	.13	999.99	99.99	999.99	0.	559.
14.000	99.999	99.999	999.99	211.67	3.61	.13	999.99	99.99	999.99	0.	556.
15.000	99.999	99.999	999.99	209.70	3.78	.19	999.99	99.99	999.99	0.	554.
16.000	99.999	99.999	999.99	208.60	3.92	.05	999.99	99.99	999.99	0.	550.
17.000	99.999	99.999	999.99	209.22	3.72	.06	999.99	99.99	999.99	0.	544.
18.000	99.999	99.999	999.99	210.72	3.30	.05	999.99	99.99	999.99	0.	537.
19.000	99.999	99.999	999.99	212.63	2.81	.09	999.99	99.99	999.99	0.	532.
20.000	99.999	99.999	999.99	214.21	2.62	-.01	999.99	99.99	999.99	0.	529.
21.000	99.999	99.999	999.99	215.66	2.50	-.01	999.99	99.99	999.99	0.	507.
22.000	99.999	99.999	999.99	216.97	2.41	-.02	999.99	99.99	999.99	0.	501.
23.000	99.999	99.999	999.99	218.25	2.32	.07	999.99	99.99	999.99	0.	495.
24.000	99.999	99.999	999.99	219.49	2.36	.19	999.99	99.99	999.99	0.	492.
25.000	99.999	99.999	999.99	220.64	2.47	.31	999.99	99.99	999.99	0.	491.
26.000	99.999	99.999	999.99	221.81	2.50	.19	999.99	99.99	999.99	0.	475.
27.000	99.999	99.999	999.99	223.02	2.59	.17	999.99	99.99	999.99	0.	435.
28.000	99.999	99.999	999.99	224.17	2.53	.35	999.99	99.99	999.99	0.	407.
29.000	99.999	99.999	999.99	225.37	2.55	.26	999.99	99.99	999.99	0.	373.
30.000	99.999	99.999	999.99	226.73	2.75	.08	999.99	99.99	999.99	0.	332.

TABLE III-11. MOISTURE RELATED STATISTICAL PARAMETERS

NOVEMBER

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	9.148	4.252	.56	282.16	6.01	-.07	277.39	7.03	-.24	537.	537.
.003	9.146	4.251	.56	282.15	6.01	-.07	277.39	7.03	-.24	537.	537.
1.000	5.847	3.736	.88	279.54	6.87	-.24	270.07	8.86	.03	537.	537.
2.000	3.739	2.802	.98	275.79	6.08	-.60	263.27	10.03	.03	537.	537.
3.000	2.293	1.831	1.32	271.57	5.66	-.76	257.27	9.25	.26	536.	537.
4.000	1.427	1.198	1.68	266.44	5.45	-.76	251.75	8.62	.40	536.	536.
5.000	.865	.734	1.83	260.33	5.39	-.71	246.16	8.24	.36	536.	536.
6.000	.487	.415	2.02	253.72	5.28	-.55	240.16	7.72	.33	533.	535.
7.000	.264	.234	2.09	246.69	5.14	-.32	233.94	7.55	.27	526.	534.
8.000	.154	.130	1.90	239.62	4.84	-.10	229.08	6.94	.28	446.	533.
9.000	.103	.071	.98	232.57	4.45	.01	225.74	6.83	-.56	176.	533.
10.000	.056	.029	1.17	226.05	3.97	.15	221.74	3.83	.68	12.	532.
11.000	99.999	99.999	999.99	220.58	3.96	.44	999.99	99.99	999.99	0.	530.
12.000	99.999	99.999	999.99	216.94	4.50	.44	999.99	99.99	999.99	0.	528.
13.000	99.999	99.999	999.99	214.58	4.61	.17	999.99	99.99	999.99	0.	526.
14.000	99.999	99.999	999.99	212.59	4.30	.05	999.99	99.99	999.99	0.	524.
15.000	99.999	99.999	999.99	210.85	4.01	.22	999.99	99.99	999.99	0.	521.
16.000	99.999	99.999	999.99	209.73	4.08	.07	999.99	99.99	999.99	0.	518.
17.000	99.999	99.999	999.99	209.34	4.12	-.14	999.99	99.99	999.99	0.	512.
18.000	99.999	99.999	999.99	210.04	3.67	-.10	999.99	99.99	999.99	0	509.
19.000	99.999	99.999	999.99	211.14	3.15	-.05	999.99	99.99	999.99	0.	504.
20.000	99.999	99.999	999.99	212.17	2.83	.19	999.99	99.99	999.99	0.	501.
21.000	99.999	99.999	999.99	213.20	2.64	.31	999.99	99.99	999.99	0.	484.
22.000	99.999	99.999	999.99	214.20	2.56	.47	999.99	99.99	999.99	0.	482.
23.000	99.999	99.999	999.99	215.30	2.67	.76	999.99	99.99	999.99	0.	477.
24.000	99.999	99.999	999.99	216.44	2.95	.89	999.99	99.99	999.99	0.	476.
25.000	99.999	99.999	999.99	217.49	3.15	.81	999.99	99.99	999.99	0.	460.
26.000	99.999	99.999	999.99	218.56	3.34	.78	999.99	99.99	999.99	0.	448.
27.000	99.999	99.999	999.99	219.71	3.37	.69	999.99	99.99	999.99	0.	412.
28.000	99.999	99.999	999.99	220.83	3.38	.62	999.99	99.99	999.99	0.	387.
29.000	99.999	99.999	999.99	222.00	3.47	.78	999.99	99.99	999.99	0.	356.
30.000	99.999	99.999	999.99	223.04	3.38	.60	999.99	99.99	999.99	0.	316.

TABLE III-12. MOISTURE RELATED STATISTICAL PARAMETERS

DECEMBER

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	6.679	3.294	.61	277.35	5.55	.00	272.83	7.14	-.20	533.	533.
.003	6.678	3.291	.61	277.34	5.55	.00	272.83	7.14	-.20	534.	534.
1.000	4.947	3.739	1.12	275.85	7.59	-.09	266.88	10.33	.01	533.	534.
2.000	3.237	2.676	1.17	273.16	6.51	-.48	260.96	10.46	.17	533.	534.
3.000	2.168	1.805	1.21	269.06	6.03	-.65	256.15	9.92	.19	533.	534.
4.000	1.355	1.144	1.44	264.04	5.65	-.70	250.84	9.15	.27	533.	534.
5.000	.844	.727	1.50	257.99	5.56	-.76	245.47	9.00	.17	533.	534.
6.000	.508	.451	1.55	251.55	5.46	-.67	240.01	8.70	.21	529.	534.
7.000	.288	.239	1.48	244.76	5.26	-.41	234.66	8.01	.00	501.	534.
8.000	.160	.120	1.50	237.74	4.88	-.14	229.50	7.26	-.38	410.	533.
9.000	.115	.062	.75	230.78	4.29	.05	227.18	6.34	-1.34	109.	532.
10.000	99.999	99.999	999.99	224.30	3.94	.17	999.99	99.99	999.99	5.	532.
11.000	99.999	99.999	999.99	219.20	4.37	.57	999.99	99.99	999.99	1.	531.
12.000	99.999	99.999	999.99	216.26	5.32	.36	999.99	99.99	999.99	0.	527.
13.000	99.999	99.999	999.99	215.03	5.21	-.18	999.99	99.99	999.99	0.	520.
14.000	99.999	99.999	999.99	213.74	4.33	-.19	999.99	99.99	999.99	0.	516.
15.000	99.999	99.999	999.99	211.87	4.23	-.22	999.99	99.99	999.99	0.	506.
16.000	99.999	99.999	999.99	210.32	4.05	-.03	999.99	99.99	999.99	0.	500.
17.000	99.999	99.999	999.99	209.74	4.00	-.19	999.99	99.99	999.99	0.	483.
18.000	99.999	99.999	999.99	209.92	3.66	-.26	999.99	99.99	999.99	0.	467.
19.000	99.999	99.999	999.99	210.56	3.40	-.21	999.99	99.99	999.99	0.	460.
20.000	99.999	99.999	999.99	211.38	3.19	-.27	999.99	99.99	999.99	0.	453.
21.000	99.999	99.999	999.99	212.23	3.04	.23	999.99	99.99	999.99	0.	436.
22.000	99.999	99.999	999.99	213.02	3.10	.60	999.99	99.99	999.99	0.	427.
23.000	99.999	99.999	999.99	213.95	3.08	.88	999.99	99.99	999.99	0.	413.
24.000	99.999	99.999	999.99	214.82	3.27	1.10	999.99	99.99	999.99	0.	418.
25.000	99.999	99.999	999.99	215.76	3.51	1.15	999.99	99.99	999.99	0.	404.
26.000	99.999	99.999	999.99	216.85	3.86	1.28	999.99	99.99	999.99	0.	392.
27.000	99.999	99.999	999.99	218.01	4.21	1.34	999.99	99.99	999.99	0.	358.
28.000	99.999	99.999	999.99	219.16	4.45	1.18	999.99	99.99	999.99	0.	344.
29.000	99.999	99.999	999.99	220.57	4.62	.89	999.99	99.99	999.99	0.	321.
30.000	99.999	99.999	999.99	222.21	4.77	.54	999.99	99.99	999.99	0.	284.

TABLE III-13. MOISTURE RELATED STATISTICAL PARAMETERS

ANNUAL

STATION = 724020 WALLOPS ISLAND

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+F	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	13.209	7.685	.41	286.33	9.77	-.21	281.54	10.13	-.46	6447.	6447.
.003	13.206	7.679	.41	286.33	9.76	-.21	281.54	10.12	-.46	6471.	6473.
1.000	8.345	5.398	.47	283.45	9.45	-.57	274.16	11.11	-.52	5449.	6471.
2.000	5.332	3.750	.59	278.88	8.07	-.72	267.63	11.21	-.36	6449.	6469.
3.000	3.224	2.429	.87	274.07	7.31	-.83	261.14	10.45	-.15	6446.	6468.
4.000	1.946	1.589	1.25	268.73	7.09	-.83	254.93	9.85	.03	6445.	6466.
5.000	1.148	.996	1.60	262.81	7.21	-.77	248.78	9.41	.08	6442.	6464.
6.000	.651	.586	1.87	256.39	7.38	-.65	242.61	8.91	.10	6406.	6455.
7.000	.365	.323	2.01	249.51	7.41	-.49	236.89	8.20	.06	6166.	6435.
8.000	.207	.170	1.96	242.44	7.25	-.31	231.78	7.26	.00	5417.	6415.
9.000	.127	.087	1.60	235.28	6.82	-.14	227.88	6.15	-.30	3307.	6405.
10.000	.073	.043	1.37	228.41	6.04	-.05	223.30	5.42	-.51	991.	6398.
11.000	99.999	99.999	999.99	222.39	5.21	-.14	999.99	99.99	999.99	9.	6385.
12.000	99.999	99.999	999.99	217.87	4.73	-.12	999.99	99.99	999.99	0.	6354.
13.000	99.999	99.999	999.99	214.98	4.62	.16	999.99	99.99	999.99	0.	6318.
14.000	99.999	99.999	999.99	212.96	4.52	.21	999.99	99.99	999.99	0.	6284.
15.000	99.999	99.999	999.99	211.33	4.46	.10	999.99	99.99	999.99	0.	6247.
16.000	99.999	99.999	999.99	210.40	4.16	.02	999.99	99.99	999.99	0.	6216.
17.000	99.999	99.999	999.99	210.54	3.70	-.04	999.99	99.99	999.99	0.	6136.
18.000	99.999	99.999	999.99	211.42	3.25	-.19	999.99	99.99	999.99	0.	6070.
19.000	99.999	99.999	999.99	212.81	3.00	-.32	999.99	99.99	999.99	0.	6005.
20.000	99.999	99.999	999.99	214.25	2.98	-.45	999.99	99.99	999.99	0.	5953.
21.000	99.999	99.999	999.99	215.73	3.15	-.42	999.99	99.99	999.99	0.	5768.
22.000	99.999	99.999	999.99	217.02	3.38	-.41	999.99	99.99	999.99	0.	5644.
23.000	99.999	99.999	999.99	218.34	3.56	-.42	999.99	99.99	999.99	0.	5560.
24.000	99.999	99.999	999.99	219.64	3.81	-.45	999.99	99.99	999.99	0.	5529.
25.000	99.999	99.999	999.99	220.94	4.04	-.50	999.99	99.99	999.99	0.	5481.
26.000	99.999	99.999	999.99	222.27	4.25	-.51	999.99	99.99	999.99	0.	5331.
27.000	99.999	99.999	999.99	223.67	4.44	-.53	999.99	99.99	999.99	0.	4971.
28.000	99.999	99.999	999.99	225.06	4.58	-.56	999.99	99.99	999.99	0.	4652.
29.000	99.999	99.999	999.99	226.58	4.68	-.56	999.99	99.99	999.99	0.	4270.
30.000	99.999	99.999	999.99	228.19	4.75	-.60	999.99	99.99	999.99	0.	3793.

TABLE IV-1. HYDROSTATIC MODEL ATMOSPHERE

JANUARY

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1019.4000	1295.0000	274.31
.003	.003	1019.0000	1294.0000	274.30
1.000	.999	899.9300	1147.0000	273.37
2.000	1.998	793.8500	1021.0000	270.75
3.000	2.996	699.2600	912.4000	266.98
4.000	3.995	614.6500	817.7000	261.88
5.000	4.993	538.8200	733.4000	255.94
6.000	5.990	470.8300	657.8000	249.35
7.000	6.987	409.9300	588.8000	242.55
8.000	7.984	355.5000	525.6000	235.64
9.000	8.981	307.0300	467.2000	228.96
10.000	9.977	264.1100	412.5000	223.03
11.000	10.973	226.3900	360.8000	218.58
12.000	11.969	193.6200	311.4000	216.59
13.000	12.964	165.4600	266.7000	216.12
14.000	13.959	141.3200	229.0000	214.96
15.000	14.954	120.5700	197.2000	213.03
16.000	15.949	102.7300	169.4000	211.30
17.000	16.943	87.4460	144.8000	210.42
18.000	17.937	74.4140	123.2000	210.36
19.000	18.930	63.3430	104.6000	211.06
20.000	19.923	53.9590	88.6100	212.14
21.000	20.916	46.0040	75.1600	213.24
22.000	21.909	39.2550	63.8300	214.23
23.000	22.901	33.5240	54.2300	215.36
24.000	23.893	28.6540	46.1300	216.37
25.000	24.884	24.5090	39.2900	217.32
26.000	25.876	20.9810	33.4600	218.42
27.000	26.867	17.9740	28.5500	219.34
28.000	27.858	15.4110	24.3300	220.62
29.000	28.848	13.2270	20.7400	222.21
30.000	29.838	11.3665	17.6800	223.99
32.000	31.815	8.4399	12.7800	229.74
34.000	33.793	6.3105	9.3410	235.07
36.000	35.769	4.7523	6.8610	241.00
38.000	37.745	3.6054	5.0620	247.81
40.000	39.719	2.7565	3.7670	254.60
42.000	41.692	2.1229	2.8250	261.48
44.000	43.663	1.6448	2.1490	266.31
46.000	45.634	1.2786	1.6570	268.43
48.000	47.603	.9950	1.2920	267.99
50.000	49.571	.7731	1.0160	264.77
52.000	51.537	.5989	.7972	261.34
54.000	53.503	.4626	.6215	258.98
56.000	55.467	.3564	.4849	255.73
58.000	57.430	.2738	.3765	253.06
60.000	59.392	.2097	.2924	249.52
62.000	61.353	.1599	.2275	244.57
64.000	63.312	.1213	.1762	233.43
66.000	65.270	.0915	.1354	235.02
68.000	67.227	.0686	.1043	228.60
70.000	69.183	.0509	.0805	220 08

TABLE IV-2. HYDROSTATIC MODEL ATMOSPHERE

FEBRUARY

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1017.9000	1293.0000	274.28
.003	.003	1017.5000	1292.0000	274.27
1.000	.999	898.4400	1148.0000	272.57
2.000	1.998	792.1400	1024.0000	269.43
3.000	2.996	697.2600	915.5000	265.33
4.000	3.995	612.3900	820.1000	260.14
5.000	4.993	536.3400	735.5000	254.03
6.000	5.990	468.1900	658.8000	247.58
7.000	6.987	407.2300	589.0000	240.85
8.000	7.984	352.8200	525.1000	234.09
9.000	8.981	304.4400	465.8000	227.68
10.000	9.977	261.7100	410.0000	222.35
11.000	10.973	224.3300	356.5000	219.22
12.000	11.969	192.0300	306.2000	218.46
13.000	12.964	164.3300	262.4000	218.14
14.000	13.959	140.5500	225.9000	216.17
15.000	14.954	120.0700	194.7000	214.85
16.000	15.949	102.4400	167.5000	213.02
17.000	16.943	87.3140	143.4000	212.07
18.000	17.937	74.3970	122.2000	212.07
19.000	18.930	63.4070	103.9000	212.64
20.000	19.923	54.0690	88.3100	213.30
21.000	20.916	46.1310	75.1000	213.99
22.000	21.909	39.3830	63.8600	214.85
23.000	22.901	33.6450	54.3500	215.67
24.000	23.893	28.7640	46.2300	216.75
25.000	24.884	24.6110	39.3870	217.73
26.000	25.876	21.0740	33.5400	218.87
27.000	26.867	18.0610	28.6000	219.97
28.000	27.858	15.4920	24.3900	221.30
29.000	28.848	13.3040	20.7800	223.06
30.000	29.838	11.4397	17.7100	224.97
32.000	31.815	8.5176	12.7100	232.98
34.000	33.793	6.3964	9.3070	238.90
36.000	35.769	4.8334	6.8630	245.08
38.000	37.745	3.6867	5.1020	251.20
40.000	39.719	2.8274	3.8240	257.03
42.000	41.692	2.1796	2.9030	260.96
44.000	43.663	1.6860	2.2240	263.46
46.000	45.634	1.3067	1.7140	264.94
48.000	47.603	1.0135	1.3320	264.49
50.000	49.571	.7853	1.0390	262.57
52.000	51.537	.6074	.8107	260.37
54.000	53.503	.4687	.6317	257.88
56.000	55.467	.3611	.4891	256.62
58.000	57.430	.2777	.3795	254.39
60.000	59.392	.2132	.2937	252.29
62.000	61.353	.1631	.2285	248.08
64.000	63.312	.1242	.1774	243.30
66.000	65.270	.0940	.1376	237.47
68.000	67.227	.0706	.1068	229.96
70.000	69.183	.0526	.0818	223.45

TABLE IV-3. HYDROSTATIC MODEL ATMOSPHERE

MARCH

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1017.6000	1274.0000	278.40
.003	.003	1017.2000	1273.0000	278.40
1.000	.999	899.9000	1132.0000	276.87
2.000	1.998	794.8700	1014.0000	273.06
3.000	2.996	700.7800	909.3000	268.48
4.000	3.995	616.3700	816.7000	262.91
5.000	4.993	540.5700	733.7000	256.68
6.000	5.990	472.5300	658.4000	250.01
7.000	6.987	411.5200	590.2000	242.91
8.000	7.984	356.9400	527.3000	235.81
9.000	8.981	308.3000	469.0000	228.98
10.000	9.977	265.2000	414.1000	223.10
11.000	10.973	227.3400	362.1000	218.72
12.000	11.969	194.4700	312.3000	216.90
13.000	12.964	166.2700	266.7000	217.22
14.000	13.959	142.1400	228.8000	216.40
15.000	14.954	121.4100	197.0000	214.67
16.000	15.949	103.5800	169.3000	213.20
17.000	16.943	88.3090	144.7000	212.62
18.000	17.937	75.2740	123.4000	212.56
19.000	18.930	64.1760	105.0000	213.01
20.000	19.923	54.7430	89.1700	213.88
21.000	20.916	46.7320	75.7700	214.87
22.000	21.909	39.9240	64.4300	215.86
23.000	22.901	34.1350	54.8300	216.90
24.000	23.893	29.2070	46.7100	217.85
25.000	24.884	25.0080	39.8400	218.70
26.000	25.876	21.4300	33.9500	219.89
27.000	26.867	18.3800	28.9400	221.22
28.000	27.858	15.7810	24.6800	222.74
29.000	28.848	13.5650	21.0500	224.55
30.000	29.838	11.6764	17.9500	226.61
32.000	31.815	8.7032	13.0300	233.02
34.000	33.793	6.5357	9.5480	238.85
36.000	35.769	4.9444	7.0410	245.01
38.000	37.745	3.7667	5.2310	251.25
40.000	39.719	2.8877	3.9320	256.26
42.000	41.692	2.2246	2.9800	260.51
44.000	43.663	1.7212	2.2720	264.36
46.000	45.634	1.3356	1.7480	266.58
48.000	47.603	1.0381	1.3550	267.36
50.000	49.571	.8073	1.0530	267.40
52.000	51.537	.6277	.8221	266.39
54.000	53.503	.4876	.6410	265.42
56.000	55.467	.3784	.5007	263.63
58.000	57.430	.2930	.3919	260.84
60.000	59.392	.2261	.3073	256.73
62.000	61.353	.1738	.2400	252.78
64.000	63.312	.1329	.1884	246.21
66.000	65.270	.1009	.1472	239.25
68.000	67.227	.0760	.1138	233.09
70.000	69.183	.0569	.0872	227.52

TABLE IV-4. HYDROSTATIC MODEL ATMOSPHERE

APRIL

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1017.4000	1250.0000	283.66
.003	.003	1017.1000	1249.0000	283.65
1.000	.999	901.6800	1116.0000	281.57
2.000	1.998	797.8800	1005.0000	276.46
3.000	2.996	704.4300	904.8000	271.22
4.000	3.995	620.4000	813.5000	265.68
5.000	4.993	544.8600	731.4000	259.51
6.000	5.990	476.9900	657.2000	252.86
7.000	6.987	416.0800	589.5000	245.89
8.000	7.984	361.5300	527.4000	238.82
9.000	8.981	312.8100	470.5000	231.62
10.000	9.977	269.4800	417.3000	224.98
11.000	10.973	231.2300	367.0000	219.50
12.000	11.969	197.8000	318.7000	216.23
13.000	12.964	168.9700	273.2000	215.45
14.000	13.959	144.3000	233.5000	215.32
15.000	14.954	123.1900	200.1000	214.48
16.000	15.949	105.1000	171.7000	213.31
17.000	16.943	89.6100	146.8000	212.67
18.000	17.937	76.3820	125.2000	212.48
19.000	18.930	65.1210	106.5000	213.11
20.000	19.923	55.5610	90.3200	214.29
21.000	20.916	47.4530	76.6000	215.82
22.000	21.909	40.5730	65.1000	217.12
23.000	22.901	34.7240	55.3900	218.37
24.000	23.893	29.7460	47.1700	219.68
25.000	24.884	25.5060	40.2200	220.91
26.000	25.876	21.8910	34.3000	222.32
27.000	26.867	18.8080	29.2800	223.76
28.000	27.858	16.1770	25.0100	225.36
29.000	28.848	13.9290	21.3700	227.05
30.000	29.838	12.0089	18.2700	228.99
32.000	31.815	8.9806	13.2200	235.85
34.000	33.793	6.7650	9.7410	241.18
36.000	35.769	5.1286	7.2290	246.35
38.000	37.745	3.9128	5.3790	252.59
40.000	39.719	3.0050	4.0400	258.32
42.000	41.692	2.3210	3.0570	263.65
44.000	43.663	1.8022	2.3290	268.65
46.000	45.634	1.4043	1.7990	271.14
48.000	47.603	1.0964	1.3980	272.31
50.000	49.571	.8563	1.0940	271.80
52.000	51.537	.6682	.8599	269.80
54.000	53.503	.5204	.6758	267.38
56.000	55.467	.4044	.5303	264.80
58.000	57.430	.3134	.4166	261.16
60.000	59.392	.2419	.3270	256.87
62.000	61.353	.1859	.2567	251.42
64.000	63.312	.1420	.2010	245.19
66.000	65.270	.1077	.1566	238.75
68.000	67.227	.0810	.1214	231.81
70.000	69.183	.0605	.0932	225.42

TABLE IV-5. HYDROSTATIC MODEL ATMOSPHERE

MAY

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1016.6000	1224.0000	289.48
.003	.003	1016.2000	1223.0000	289.46
1.000	.999	902.9300	1098.0000	286.47
2.000	1.998	800.6100	992.8000	280.94
3.000	2.996	708.2200	895.6000	275.48
4.000	3.995	624.9700	806.6000	269.91
5.000	4.993	550.0400	726.0000	263.94
6.000	5.990	482.6300	653.2000	257.38
7.000	6.987	422.0100	587.4000	250.28
8.000	7.984	367.5700	527.1000	242.94
9.000	8.981	318.8000	471.8000	235.40
10.000	9.977	275.2400	420.6000	227.97
11.000	10.973	236.5400	372.6000	221.13
12.000	11.969	202.4200	327.0000	215.64
13.000	12.964	172.7100	282.8000	212.78
14.000	13.959	147.2100	241.0000	212.81
15.000	14.954	125.4900	205.2000	213.07
16.000	15.949	106.9800	175.3000	212.53
17.000	16.943	91.1680	149.6000	212.27
18.000	17.937	77.7060	127.2000	212.76
19.000	18.930	66.2780	107.9000	213.97
20.000	19.923	56.5910	91.4800	215.50
21.000	20.916	48.3800	77.5700	217.27
22.000	21.909	41.4120	65.9400	218.77
23.000	22.901	35.4840	56.1600	220.13
24.000	23.893	30.4360	47.8600	221.54
25.000	24.884	26.1330	40.8400	222.93
26.000	25.876	22.4610	34.8600	224.45
27.000	26.867	19.3270	29.7900	226.02
28.000	27.858	16.6480	25.4700	227.75
29.000	28.848	14.3580	21.7900	229.56
30.000	29.838	12.3903	18.6700	231.38
32.000	31.815	9.2968	13.6300	237.81
34.000	33.793	7.0179	10.0800	242.77
36.000	35.769	5.3313	7.4820	248.42
38.000	37.745	4.0760	5.5850	254.45
40.000	39.719	3.1363	4.2030	260.20
42.000	41.692	2.4265	3.1910	265.15
44.000	43.663	1.8863	2.4400	269.55
46.000	45.634	1.4714	1.8820	272.57
48.000	47.603	1.1500	1.4670	273.26
50.000	49.571	.8989	1.1500	272.63
52.000	51.537	.7021	.9033	270.96
54.000	53.503	.5472	.7119	267.97
56.000	55.467	.4252	.5611	264.21
58.000	57.430	.3293	.4407	260.51
60.000	59.392	.2541	.3455	256.40
62.000	61.353	.1951	.2712	250.85
64.000	63.312	.1488	.2134	243.06
66.000	65.270	.1124	.1672	234.50
68.000	67.227	.0841	.1295	226.48
70.000	69.183	.0622	.1001	216.78

TABLE IV-6. HYDROSTATIC MODEL ATMOSPHERE

JUNE

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1017.0000	1202.0000	294.73
.003	.003	1016.6000	1202.0000	294.72
1.000	.999	905.1200	1083.0000	291.09
2.000	1.998	803.9900	982.9000	284.95
3.000	2.996	712.4300	888.5000	279.32
4.000	3.995	629.8000	801.1000	273.87
5.000	4.993	555.3600	721.4000	268.19
6.000	5.990	488.3500	649.5000	261.93
7.000	6.987	428.0600	584.4000	255.19
8.000	7.984	373.8800	525.0000	248.11
9.000	8.981	325.2500	470.9000	240.64
10.000	9.977	281.7100	421.3000	232.96
11.000	10.973	242.8300	375.4000	225.34
12.000	11.969	208.3000	332.6000	218.21
13.000	12.964	177.9100	291.0000	212.94
14.000	13.959	151.5300	250.5000	210.74
15.000	14.954	128.9300	213.8000	210.11
16.000	15.949	109.6800	182.0000	209.95
17.000	16.943	93.3160	154.4000	210.57
18.000	17.937	79.4590	130.7000	211.86
19.000	18.930	67.7460	110.4000	213.78
20.000	19.923	57.8430	93.4400	215.65
21.000	20.916	49.4590	79.2000	217.55
22.000	21.909	42.3480	67.2500	219.36
23.000	22.901	36.3060	57.2100	221.07
24.000	23.893	31.1650	48.7300	222.78
25.000	24.884	26.7830	41.5800	224.41
26.000	25.876	23.0440	35.5200	226.01
27.000	26.867	19.8490	30.3700	227.68
28.000	27.858	17.1170	25.9800	229.49
29.000	28.848	14.7790	22.2600	231.25
30.000	29.838	12.7751	19.1000	232.96
32.000	31.815	9.5923	14.0300	238.45
34.000	33.793	7.2448	10.4000	243.05
36.000	35.769	5.5041	7.7340	248.26
38.000	37.745	4.2070	5.7750	254.13
40.000	39.719	3.2364	4.3420	260.04
42.000	41.692	2.5038	3.2940	265.20
44.000	43.663	1.9470	2.5130	270.24
46.000	45.634	1.5194	1.9420	272.87
48.000	47.603	1.1879	1.5140	273.75
50.000	49.571	.9290	1.1870	273.05
52.000	51.537	.7257	.9346	270.83
54.000	53.503	.5656	.7358	268.10
56.000	55.467	.4396	.5800	264.36
58.000	57.430	.3403	.4572	259.65
60.000	59.392	.2621	.3601	253.89
62.000	61.353	.2007	.2823	248.03
64.000	63.312	.1525	.2226	238.91
66.000	65.270	.1147	.1733	230.80
68.000	67.227	.0854	.1338	222.66
70.000	69.183	.0627	.1044	209.34

TABLE IV-7. HYDROSTATIC MODEL ATMOSPHERE

JULY

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1018.9000	1189.0000	298.03
.003	.003	1016.6000	1188.0000	298.02
1.000	.999	906.0800	1076.0000	293.49
2.000	1.998	805.5800	977.7000	287.05
3.000	2.996	714.4700	884.6000	281.38
4.000	3.995	632.1500	798.5000	275.78
5.000	4.993	557.9300	719.6000	270.11
6.000	5.990	491.1000	647.7000	264.15
7.000	6.987	430.9800	582.8000	257.62
8.000	7.984	376.9200	523.9000	250.65
9.000	8.981	328.3800	470.2000	243.29
10.000	9.977	284.8700	421.1000	235.66
11.000	10.973	245.9800	375.9000	228.00
12.000	11.969	211.3800	333.7000	220.70
13.000	12.964	180.8200	293.2000	214.81
14.000	13.959	154.1200	254.7000	210.84
15.000	14.954	131.0600	218.9000	208.55
16.000	15.949	111.3600	186.0000	208.55
17.000	16.943	94.6850	157.0000	210.15
18.000	17.937	80.6180	132.4000	212.05
19.000	18.930	68.7510	111.8000	214.24
20.000	19.923	58.7240	94.6000	216.26
21.000	20.916	50.2350	80.1900	218.23
22.000	21.909	43.0320	68.1600	219.93
23.000	22.901	36.9070	58.0100	221.64
24.000	23.893	31.6930	49.4300	223.36
25.000	24.884	27.2480	42.1900	224.96
26.000	25.876	23.4520	36.0700	226.53
27.000	26.867	20.2070	30.8600	228.08
28.000	27.858	17.4280	26.4600	229.48
29.000	28.848	15.0460	22.6900	231.00
30.000	29.838	13.0035	19.4700	232.64
32.000	31.815	9.7535	14.2900	237.04
34.000	33.793	7.3526	10.5800	241.23
36.000	35.769	5.5738	7.8610	246.21
38.000	37.745	4.2483	5.8790	250.95
40.000	39.719	3.2561	4.4150	256.07
42.000	41.692	2.5095	3.3320	261.56
44.000	43.663	1.9443	2.5370	266.12
46.000	45.634	1.5121	1.9480	269.53
48.000	47.603	1.1785	1.5140	270.32
50.000	49.571	.9185	1.1860	269.01
52.000	51.537	.7149	.9299	266.91
54.000	53.503	.5549	.7318	263.28
56.000	55.467	.4293	.5743	259.49
58.000	57.430	.3307	.4512	254.43
60.000	59.392	.2533	.3538	248.54
62.000	61.353	.1927	.2773	241.23
64.000	63.312	.1455	.2148	235.18
66.000	65.270	.1092	.1644	230.45
68.000	67.227	.0814	.1257	224.75
70.000	69.183	.0601	.0962	217.06

TABLE IV-8. HYDROSTATIC MODEL ATMOSPHERE

AUGUST

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1017.7000	1190.0000	297.86
.003	.003	1017.3000	1190.0000	297.86
1.000	.999	906.6600	1077.0000	293.24
2.000	1.998	806.0800	978.0000	287.14
3.000	2.996	714.9700	884.3000	281.67
4.000	3.995	632.6900	798.1000	276.17
5.000	4.993	558.5100	719.1000	270.56
6.000	5.990	491.7100	647.5000	264.53
7.000	6.987	431.5900	582.8000	257.96
8.000	7.984	377.5300	524.0000	251.00
9.000	8.981	328.9700	470.4000	243.64
10.000	9.977	285.4400	421.5000	235.91
11.000	10.973	246.5000	376.5000	228.11
12.000	11.969	211.8200	334.5000	220.59
13.000	12.964	181.1600	294.4000	214.35
14.000	13.959	154.3500	255.9000	210.15
15.000	14.954	131.1900	219.7000	208.04
16.000	15.949	111.4300	186.6000	208.01
17.000	16.943	94.6990	157.4000	209.55
18.000	17.937	80.6020	132.6000	211.73
19.000	18.930	68.7230	111.9000	214.03
20.000	19.923	58.6920	94.6300	216.07
21.000	20.916	50.1990	80.2400	217.95
22.000	21.909	42.9920	68.1900	219.65
23.000	22.901	36.8650	58.0400	221.26
24.000	23.893	31.6480	49.4600	222.92
25.000	24.884	27.2000	42.2200	224.42
26.000	25.876	23.4010	36.0900	225.87
27.000	26.867	20.1540	30.8800	227.34
28.000	27.858	17.3740	26.4600	228.70
29.000	28.848	14.9910	22.7000	230.09
30.000	29.838	12.9474	19.4900	231.44
32.000	31.815	9.6939	14.2500	235.31
34.000	33.793	7.2916	10.5400	239.26
36.000	35.769	5.5126	7.8330	243.47
38.000	37.745	4.1884	5.8440	247.97
40.000	39.719	3.2002	4.3730	253.21
42.000	41.692	2.4588	3.2940	258.28
44.000	43.663	1.8993	2.4950	263.34
46.000	45.634	1.4732	1.9110	266.70
48.000	47.603	1.1453	1.4810	267.57
50.000	49.571	.8906	1.1530	267.15
52.000	51.537	.6919	.9035	264.91
54.000	53.503	.5362	.7080	261.99
56.000	55.467	.4143	.5554	258.02
58.000	57.430	.3189	.4328	254.93
60.000	59.392	.2445	.3390	249.53
62.000	61.353	.1862	.2655	242.67
64.000	63.312	.1409	.2060	236.55
66.000	65.270	.1058	.1581	231.52
68.000	67.227	.0790	.1208	226.43
70.000	69.183	.0585	.0926	218.74

TABLE IV-9. HYDROSTATIC MODEL ATMOSPHERE

SEPTEMBER

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1018.2000	1205.0000	294.40
.003	.003	1017.9000	1204.0000	294.39
1.000	.999	905.9600	1088.0000	290.05
2.000	1.998	804.5800	983.6000	284.97
3.000	2.996	713.0500	887.2000	279.99
4.000	3.995	630.5600	799.5000	274.75
5.000	4.993	556.2500	720.3000	269.03
6.000	5.990	489.3400	648.7000	262.78
7.000	6.987	429.1000	584.1000	255.94
8.000	7.984	374.9300	524.9000	248.82
9.000	8.981	326.3000	471.0000	241.32
10.000	9.977	282.7300	421.4000	233.73
11.000	10.973	243.8600	375.3000	226.38
12.000	11.969	209.3700	331.9000	219.77
13.000	12.964	179.0200	290.7000	214.51
14.000	13.959	152.5600	252.5000	210.50
15.000	14.954	129.6800	217.4000	207.84
16.000	15.949	110.0900	185.2000	207.04
17.000	16.943	93.4760	156.4000	208.18
18.000	17.937	79.4770	131.6000	210.36
19.000	18.930	67.7000	110.8000	212.91
20.000	19.923	57.7740	93.5600	215.11
21.000	20.916	49.3830	79.2200	217.15
22.000	21.909	42.2670	67.3200	218.72
23.000	22.901	36.2190	57.2700	220.31
24.000	23.893	31.0720	48.7800	221.88
25.000	24.884	26.6860	41.6200	223.39
26.000	25.876	22.9440	35.5500	224.86
27.000	26.867	19.7460	30.4000	226.29
28.000	27.858	17.0100	26.0500	227.48
29.000	28.848	14.6640	22.3500	228.51
30.000	29.838	12.6515	19.1900	229.71
32.000	31.815	9.4525	14.0700	233.68
34.000	33.793	7.0940	10.4000	237.16
36.000	35.769	5.3499	7.7100	241.28
38.000	37.745	4.0573	5.7150	246.90
40.000	39.719	3.0972	4.2640	252.59
42.000	41.692	2.3785	3.2060	257.97
44.000	43.663	1.8370	2.4260	263.31
46.000	45.634	1.4248	1.8580	266.70
48.000	47.603	1.1077	1.4390	267.75
50.000	49.571	.8616	1.1210	267.26
52.000	51.537	.6698	.8744	266.35
54.000	53.503	.5201	.6835	264.57
56.000	55.467	.4031	.5354	261.74
58.000	57.430	.3114	.4197	257.92
60.000	59.392	.2394	.3301	252.12
62.000	61.353	.1830	.2576	247.07
64.000	63.312	.1392	.2000	242.08
66.000	65.270	.1054	.1541	237.77
68.000	67.227	.0793	.1188	231.90
70.000	69.183	.0590	.0927	221.27

TABLE IV-10. HYDROSTATIC MODEL ATMOSPHERE

OCTOBER

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1019.4000	1235.0000	287.69
.003	.003	1019.0000	1234.0000	287.67
1.000	.999	904.6600	1109.0000	284.06
2.000	1.998	801.5900	996.9000	280.11
3.000	2.996	709.0100	895.6000	275.80
4.000	3.995	625.8200	805.4000	270.68
5.000	4.993	551.0000	724.7000	264.86
6.000	5.990	483.6900	652.4000	258.28
7.000	6.987	423.1400	586.9000	251.15
8.000	7.984	368.7400	526.8000	243.85
9.000	8.981	319.9900	471.5000	236.42
10.000	9.977	276.4700	420.2000	229.18
11.000	10.973	237.8200	371.9000	222.77
12.000	11.969	203.7900	326.0000	217.80
13.000	12.964	174.1200	283.0000	214.35
14.000	13.959	148.4300	244.3000	211.67
15.000	14.954	126.3200	209.9000	209.70
16.000	15.949	107.3800	179.3000	208.60
17.000	16.943	91.2700	152.0000	209.22
18.000	17.937	77.6430	128.4000	210.72
19.000	18.930	66.1410	108.4000	212.63
20.000	19.923	56.4190	91.7500	214.21
21.000	20.916	48.1820	77.8300	215.66
22.000	21.909	41.1910	66.1400	216.97
23.000	22.901	35.2490	56.2600	218.25
24.000	23.893	30.1930	47.9200	219.49
25.000	24.884	25.8850	40.8700	220.64
26.000	25.876	22.2110	34.8800	221.81
27.000	26.867	19.0750	29.7900	223.02
28.000	27.858	16.3950	25.4800	224.17
29.000	28.848	14.1040	21.8000	225.37
30.000	29.838	12.1441	18.6600	226.73
32.000	31.815	9.0432	13.6400	231.42
34.000	33.793	6.7663	10.0700	234.51
36.000	35.769	5.0836	7.4650	237.65
38.000	37.745	3.8397	5.5050	243.44
40.000	39.719	2.9199	4.0920	249.05
42.000	41.692	2.2334	3.0700	253.91
44.000	43.663	1.7181	2.3100	259.52
46.000	45.634	1.3282	1.7580	263.72
48.000	47.603	1.0301	1.3540	265.57
50.000	49.571	.7998	1.0500	265.86
52.000	51.537	.6212	.8164	265.49
54.000	53.503	.4821	.6362	264.44
56.000	55.467	.3736	.4975	262.05
58.000	57.430	.2890	.3878	260.05
60.000	59.392	.2230	.3028	256.95
62.000	61.353	.1715	.2361	253.44
64.000	63.312	.1315	.1831	250.65
66.000	65.270	.1005	.1423	246.28
68.000	67.227	.0764	.1100	242.44
70.000	69.183	.0578	.0856	235.38

TABLE IV-11. HYDROSTATIC MODEL ATMOSPHERE

NOVEMBER

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1019.0000	1259.0000	282.16
.003	.003	1018.6000	1258.0000	282.15
1.000	.999	902.3800	1125.0000	279.54
2.000	1.998	798.0200	1008.0000	275.79
3.000	2.996	704.5100	903.7000	271.57
4.000	3.995	620.6300	811.5000	266.44
5.000	4.993	545.2800	729.7000	260.33
6.000	5.990	477.5600	655.7000	253.72
7.000	6.987	416.7700	588.5000	246.69
8.000	7.984	362.2900	526.7000	239.62
9.000	8.981	313.6400	469.8000	232.57
10.000	9.977	270.3800	416.7000	226.05
11.000	10.973	232.1600	366.7000	220.58
12.000	11.969	198.7300	319.1000	216.94
13.000	12.964	169.7500	275.6000	214.58
14.000	13.959	144.7700	237.2000	212.59
15.000	14.954	123.3100	203.7000	210.85
16.000	15.949	104.9100	174.3000	209.73
17.000	16.943	89.2130	148.5000	209.34
18.000	17.937	75.8770	125.8000	210.04
19.000	18.930	64.5820	106.6000	211.14
20.000	19.923	55.0160	90.3300	212.17
21.000	20.916	46.9060	76.6500	213.20
22.000	21.909	40.0240	65.0900	214.20
23.000	22.901	34.1790	55.3000	215.30
24.000	23.893	29.2140	47.0200	216.44
25.000	24.884	24.9910	40.0300	217.49
26.000	25.876	21.3950	34.1000	218.56
27.000	26.867	18.3320	29.0700	219.71
28.000	27.858	15.7210	24.8000	220.83
29.000	28.848	13.4930	21.1700	222.00
30.000	29.838	11.5805	18.1000	223.04
32.000	31.815	8.5837	13.2200	226.74
34.000	33.793	6.3850	9.6940	229.97
36.000	35.769	4.7732	7.1190	234.08
38.000	37.745	3.5887	5.2370	239.26
40.000	39.719	2.7182	3.8550	246.18
42.000	41.692	2.0745	2.8660	252.67
44.000	43.663	1.5940	2.1540	258.36
46.000	45.634	1.2309	1.6360	262.72
48.000	47.603	.9540	1.2560	265.16
50.000	49.571	.7405	.9738	265.44
52.000	51.537	.5748	.7575	264.86
54.000	53.503	.4455	.5923	262.58
56.000	55.467	.3448	.4617	260.66
58.000	57.430	.2663	.3593	258.67
60.000	59.392	.2053	.2789	257.02
62.000	61.353	.1579	.2176	253.34
64.000	63.312	.1212	.1678	252.16
66.000	65.270	.0927	.1305	248.04
68.000	67.227	.0707	.1010	244.32
70.000	69.183	.0534	.0800	233.26

TABLE IV-12. HYDROSTATIC MODEL ATMOSPHERE

DECEMBER

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1019.3000	1281.0000	277.35
.003	.003	1018.9000	1280.0000	277.34
1.000	.999	900.9700	1138.0000	275.65
2.000	1.998	795.6600	1015.0000	273.16
3.000	2.996	701.5900	908.4000	269.06
4.000	3.995	617.3300	814.5000	264.04
5.000	4.993	541.7500	731.5000	257.99
6.000	5.990	473.9100	656.3000	251.55
7.000	6.987	413.1200	588.0000	244.76
8.000	7.984	358.7300	525.7000	237.74
9.000	8.981	310.2000	468.3000	230.78
10.000	9.977	267.1000	414.8000	224.30
11.000	10.973	229.1100	364.1000	219.20
12.000	11.969	195.9700	315.7000	216.26
13.000	12.964	167.3800	271.2000	215.03
14.000	13.959	142.8400	232.8000	213.74
15.000	14.954	121.7500	200.2000	211.87
16.000	15.949	103.6500	171.7000	210.32
17.000	16.943	88.1770	146.5000	209.74
18.000	17.937	75.0040	124.5000	209.92
19.000	18.930	63.8230	105.6000	210.56
20.000	19.923	54.3410	89.5600	211.38
21.000	20.916	46.2990	76.0000	212.23
22.000	21.909	39.4740	64.5600	213.02
23.000	22.901	33.6780	54.8400	213.95
24.000	23.893	28.7540	46.6300	214.82
25.000	24.884	24.5680	39.6700	215.76
26.000	25.876	21.0070	33.7500	216.85
27.000	26.867	17.9780	28.7300	218.01
28.000	27.858	15.3990	24.4800	219.16
29.000	28.848	13.2030	20.8500	220.57
30.000	29.838	11.3326	17.7700	222.21
32.000	31.815	8.3993	12.7800	228.75
34.000	33.793	6.2711	9.3410	233.76
36.000	35.769	4.7134	6.8640	239.06
38.000	37.745	3.5672	5.0600	245.48
40.000	39.719	2.7205	3.7550	252.27
42.000	41.692	2.0884	2.8230	257.55
44.000	43.663	1.6119	2.1380	262.47
46.000	45.634	1.2500	1.6300	267.02
48.000	47.603	.9722	1.2620	268.28
50.000	49.571	.7562	.9865	266.88
52.000	51.537	.5877	.7694	265.89
54.000	53.503	.4558	.6040	262.71
56.000	55.467	.3527	.4713	260.55
58.000	57.430	.2722	.3685	257.12
60.000	59.392	.2093	.2877	253.28
62.000	61.353	.1603	.2245	248.95
64.000	63.312	.1222	.1739	244.51
66.000	65.270	.0927	.1340	240.90
68.000	67.227	.0702	.1025	238.28
70.000	69.183	.0529	.0788	233.63

TABLE IV-13. HYDROSTATIC MODEL ATMOSPHERE

ANNUAL

STATION = 724020 WALLOPS ISLAND

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1018.0000	1240.0000	286.33
.003	.003	1017.7000	1238.0000	286.33
1.000	.999	903.0800	1110.0000	283.45
2.000	1.994	799.8700	999.2000	278.88
3.000	2.996	707.0200	898.7000	274.07
4.000	3.995	623.5400	808.3000	268.73
5.000	4.993	548.4700	727.0000	262.81
6.000	5.990	480.9900	653.6000	256.39
7.000	6.987	420.3800	587.0000	249.51
8.000	7.984	366.0200	525.9000	242.44
9.000	8.981	317.4000	470.0000	235.28
10.000	9.977	274.0600	418.0000	228.41
11.000	10.973	235.6600	369.2000	222.39
12.000	11.969	201.9200	322.9000	217.87
13.000	12.964	172.5600	279.6000	214.98
14.000	13.959	147.2100	240.8000	212.96
15.000	14.954	125.4200	206.7000	211.33
16.000	15.949	106.7600	176.8000	210.40
17.000	16.943	90.8470	150.3000	210.54
18.000	17.937	77.3430	127.4000	211.42
19.000	18.930	65.9070	107.9000	212.81
20.000	19.923	56.2240	91.4200	214.25
21.000	20.916	48.0170	77.5400	215.72
22.000	21.909	41.0520	65.9000	217.02
23.000	22.901	35.1320	56.0500	218.34
24.000	23.893	30.0950	47.7300	219.64
25.000	24.884	25.8060	40.6900	220.94
26.000	25.876	22.1480	34.7100	222.27
27.000	26.867	19.0280	29.6400	223.67
28.000	27.858	16.3640	25.3300	225.06
29.000	28.848	14.0870	21.6600	226.58
30.000	29.838	12.1401	18.5300	228.19
32.000	31.815	9.0610	13.5100	233.55
34.000	33.793	6.8036	9.9460	238.12
36.000	35.769	5.1393	7.3580	243.13
38.000	37.745	3.9061	5.4630	248.92
40.000	39.719	2.9885	4.0830	254.77
42.000	41.692	2.3000	3.0790	260.02
44.000	43.663	1.7794	2.3400	264.69
46.000	45.634	1.3818	1.7960	267.78
48.000	47.603	1.0753	1.3930	268.66
50.000	49.571	.8369	1.0870	267.88
52.000	51.537	.6508	.8509	266.19
54.000	53.503	.5051	.6664	263.84
56.000	55.467	.3912	.5216	261.00
58.000	57.430	.3020	.4078	257.80
60.000	59.392	.2324	.3188	253.76
62.000	61.353	.1790	.2492	248.61
64.000	63.312	.1356	.1942	242.92
66.000	65.270	.1026	.1505	237.20
68.000	67.227	.0771	.1160	231.44
70.000	69.183	.0575	.0897	223.04

APPENDIX A

EXAMPLES OF WIND STATISTICS FOR WALLOPS ISLAND, VIRGINIA

Appendix A gives some examples of graphical displays of wind statistics that can be derived from the statistical parameters presented in table I. These illustrations should aid the user of the RRA to understand the functional relationships of the probability wind models and, thus, to develop an appreciation of the powerful properties of the bivariate normal probability distribution function.

All illustrations for this appendix are derived from the five wind component statistical parameters from table I.1 for January and table I.7 for July for eight selected altitudes. These selected altitudes are 4, 12, 20, 30, 40, 50, 60, and 70 km.

1. Windspeed (Tables A-1 and A-2)

(a) Percentile Values of Windspeed - The five wind component parameters from table I are used as inputs to the generalized Rayleigh probability density function (pdf), equation (29), and then numerically integrated as indicated by equation (30) to obtain the probability distribution function (PDF). Interpolations are performed on the PDF to obtain the windspeed percentile values shown in tables A-1 and A-2.

(b) Derived Moment Statistics - For this RRA further computations to derive moment statistics from the Rayleigh distribution have been performed.

The first moment, called the mean, $\overline{R}$, is defined as:

$$\overline{R} = \int_0^\infty R\, f(R)\, dR \quad , \tag{A-1}$$

where f(R) is the generalized Rayleigh pdf, equation (29).

The second moment with respect to the mean is also called the variance, σ^2, and is defined as:

$$\sigma^2 = \int_0^\infty (R - \overline{R})^2\, f(R)\, dR \quad . \tag{A-2}$$

The square root of the variance is the standard deviation. The standard deviation is denoted as S.D. in tables A-1 and A-2.

The third moment with respect to the mean is defined as:

$$\mu_3 = \int_0^\infty (R - \overline{R})^3 f(R)\, dR \quad . \tag{A-3}$$

The nondimensional skewness coefficient, α_3, is defined as:

$$\alpha_3 = \mu_3/\sigma^3 \quad . \tag{A-4}$$

Equations (A-1) through (A-3) have been solved using a simple numerical integration (Simpson's rule) technique. Theoretically all moments of the Rayleigh distribution are greater than or equal to zero. However, there are some spurious small negative skewness coefficients at some high altitudes during the summer months. This is caused by inaccuracy in the numerical integration for the third moment.

The mean, standard deviations, and skewness coefficient derived from the Rayleigh distribution are comparable with the respective sample estimates given in table I.

For the Rayleigh distribution the mean is greater than or equal to the median and the median is greater than or equal to the mode. This condition is satisfied within the numerical evaluation limits.

2. Frequency of Wind Direction (Figures A-1 through A-16)

The derived frequencies for wind direction shown in figures A-1 through A-16 were obtained using the five wind component parameters from tables I.1 and I.7 as input values in equation (35). The limits of integration (performed numerically) are over the 22.5-degree interval for each of the 16 compass points. These graphs give the percentage frequency that the wind will blow from the direction intervals.

3. Mean Wind Components and 80th Interpercentile Range of Wind Components (Figures A-17 through A-32)

The wind component means with respect to any orthogonal axes are obtained by using the zonal and meridional mean wind components in equations (44) and (45). These component means form the circles shown in figures A-17 through A-32. Further, the zonal and meridional wind component variances and correlation coefficients are used in equations (46) and (47) to obtain the variances with respect to any orthogonal axes. These rotated component variances and the rotated component means are used in equation (8) to obtain the 80th interpercentile range of wind components and are then illustrated in figures A-17 through A-32.

4. Probability Ellipses (Figures A-33 through A-48)

Using the five wind component parameters from tables I.1 and I.7 and $p = 0.50$, $p = 0.95$, and $p = 0.99$ as input values to equation (13), the wind probability ellipses shown in figures A-33 through A-48 were obtained by computer graphics. The statistical inferences are, for example, that 50 percent of the wind vectors lie within the smaller ellipse and 99 percent of the wind vectors lie within the outer ellipse. These probability ellipses are illustrated using the standard meteorological coordinate system explained in section I.B.1.

5. Conditional Windspeed Given the Wind Direction (Figures A-49 through A-64)

The five wind component parameters from table I.1 and table I.7 are used to evaluate the conditional probability distribution function, equation (41). Figures A-49 through A-64 show interpolations of the conditional function made to obtain the 5th, 15th, 50th (median), 85th, 95th, and 99th conditional percentile values of windspeed, given the wind directions. The conditional mean windspeed, given the wind direction, is obtained from equation (40). The conditional mode (most probable) windspeed, given the wind direction, is obtained from equation (38). The conditional mean windspeed and the conditional windspeed modal value, given the wind direction, are also shown in these figures. For some figures, the conditional windspeed values are invalid for the given wind direction near 270° (from the west). This is caused by the lack of computational precision in evaluating equations (40) and (41) when the arguments for the Gaussian probability distribution have large negative values, i.e., when the coefficients (b/a) become less than -4 in these equations.

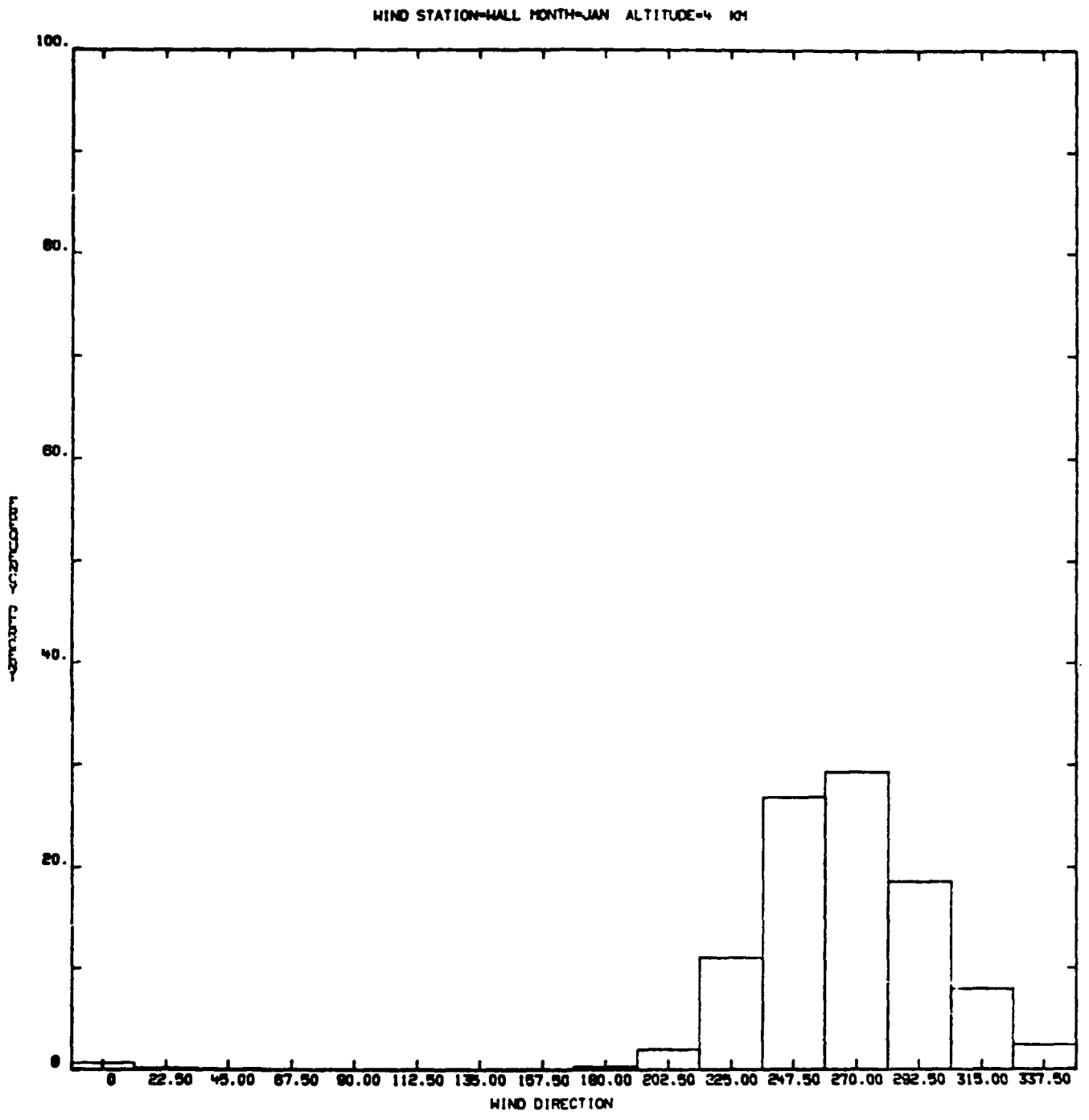
This appendix contains only a few of the many options in presenting wind statistics illustrations.

TABLE A-1. PERCENTILE VALUES FOR WIND SPEED AND MOMENT STATISTICS DERIVED FROM THE RAYLEIGH DISTRIBUTION, WALLOPS ISLAND, VA, JANUARY

Alt (km)	4	12	20	30	40	50	60	70
Percent	m/s	m/s	m/s	m/s	m/s	m/s	m/s	m/s
1.00	3.48	9.14	1.94	2.06	4.03	9.04	9.38	7.69
2.50	5.49	13.55	3.09	3.28	6.40	14.17	14.76	12.22
5.00	7.70	17.86	4.37	4.70	9.17	19.80	20.71	17.39
10.00	10.72	23.16	6.24	6.83	13.26	27.52	29.02	24.89
15.00	12.99	26.87	7.69	8.56	16.62	33.34	35.38	30.83
20.00	14.87	29.87	8.94	10.15	19.66	38.23	40.79	36.00
30.00	18.08	34.81	11.09	13.13	25.32	46.59	50.10	45.06
40.00	20.91	39.09	13.01	16.13	30.85	54.03	58.40	53.26
50.00	23.60	43.11	14.84	19.33	36.53	61.15	66.31	61.17
60.00	26.34	47.16	16.71	22.90	42.59	68.40	74.33	69.23
70.00	29.29	51.51	18.72	27.07	49.35	76.26	82.99	77.96
80.00	32.77	56.62	21.08	32.27	57.49	85.55	93.20	88.27
85.00	34.92	59.77	22.55	35.57	62.56	91.30	99.49	94.63
90.00	37.64	63.74	24.40	39.80	68.97	98.56	107.44	102.67
95.00	41.68	69.64	27.13	46.16	78.56	109.37	119.24	114.63
97.50	45.20	74.77	29.53	51.74	86.90	118.79	129.52	125.02
99.00	49.31	80.75	32.30	58.27	96.64	129.79	141.49	137.15
Mean (m/s)	23.95	43.27	15.13	21.56	39.12	62.27	67.47	62.73
S.D. (m/s)	10.23	15.56	6.86	12.81	21.34	27.019	29.76	29.48
Skewness	0.243	0.106	0.287	0.793	0.587	0.274	0.270	0.335

TABLE A-2. PERCENTILE VALUES FOR WIND SPEED AND MOMENT STATISTICS DERIVED FROM THE RAYLEIGH DISTRIBUTION, WALLOPS ISLAND, VA, JULY

Alt (km)	4	12	20	30	40	50	60	70
Percent	m/s	m/s	m/s	m/s	m/s	m/s	m/s	m/s
1.00	1.14	2.18	1<	9.55	19.69	28.12	34.53	15.27
2.50	1.85	3.48	1.39	10.69	21.48	31.00	38.96	21.42
5.00	2.64	5.00	2.05	11.66	23.07	33.44	42.76	27.08
10.00	3.82	7.19	2.83	12.79	24.85	36.30	37.16	33.82
15.00	4.74	8.96	3.41	13.53	26.06	38.23	50.14	38.45
20.00	5.55	10.53	3.94	14.15	27.02	39.76	52.50	42.17
30.00	7.00	13.42	4.77	15.13	28.57	42.26	56.35	48.28
40.00	8.33	16.19	5.51	15.96	29.91	44.39	59.65	53.53
50.00	9.66	19.02	6.22	16.74	31.16	46.39	62.74	58.47
60.00	11.03	22.08	6.92	17.53	32.41	48.39	65.82	63.42
70.00	12.56	25.58	7.69	18.37	33.75	50.53	69.13	68.73
80.00	14.39	29.92	8.61	19.35	35.32	53.02	72.99	74.97
85.00	15.53	32.69	9.14	19.93	36.28	54.57	75.38	78.81
90.00	16.95	36.27	9.85	20.71	37.50	56.51	78.37	83.65
95.00	19.13	41.70	10.89	21.82	39.29	59.38	82.80	90.83
97.50	21.01	46.48	11.81	22.80	50.84	61.86	86.66	97.06
99.00	23.26	52.09	12.86	23.91	42.67	64.77	91.12	104.34
Mean (m/s)	10.09	20.56	6.29	16.67	31.10	46.33	62.64	58.54
S.D. (m/s)	5.00	11.23	2.65	3.01	4.89	7.83	12.09	19.20
Skewness	0.465	0.684	0.221	-0.009	-0.007	-0.004	-0.006	0.063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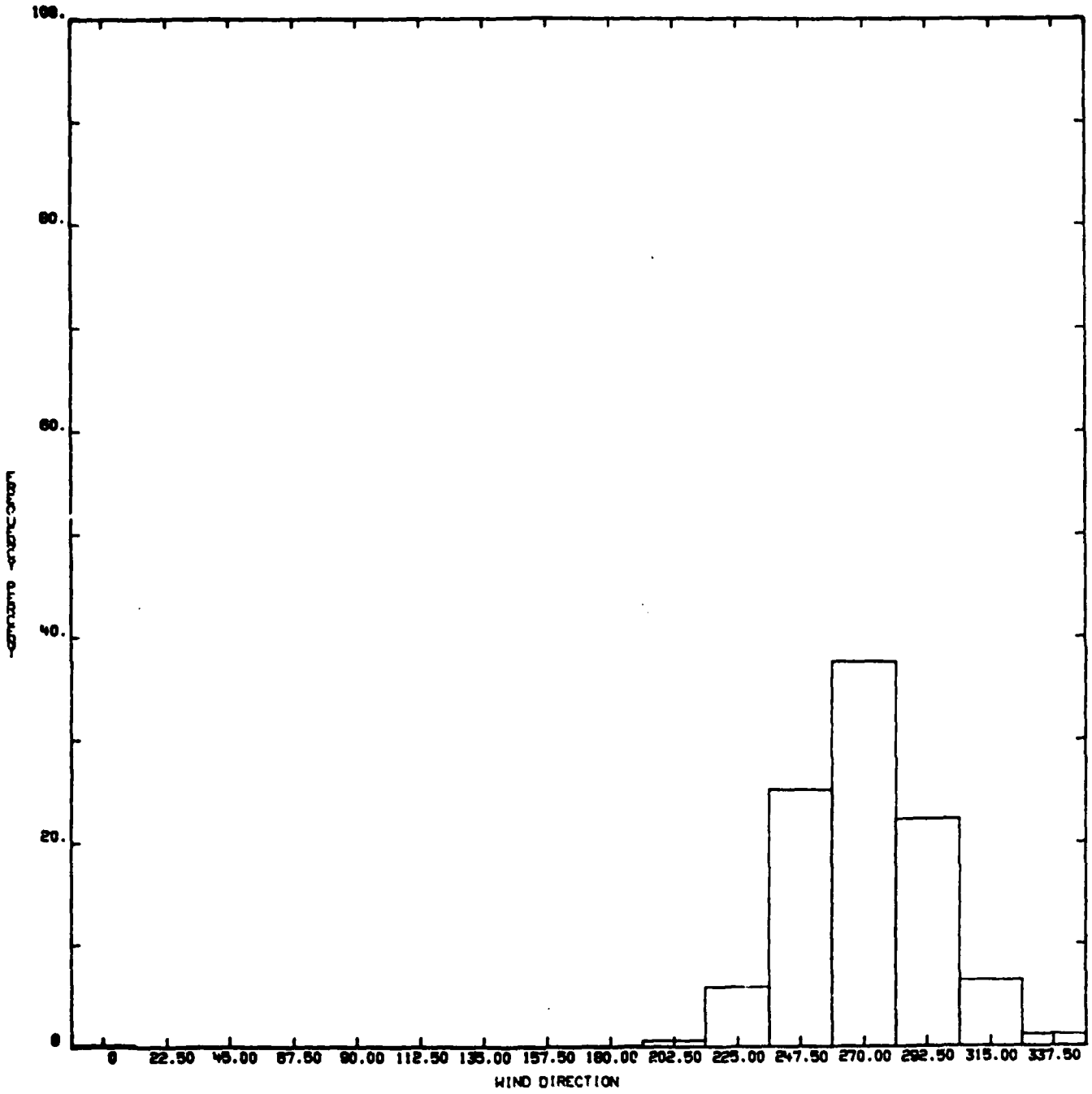
60.
40.
20.
0
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Figure A-1.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60.
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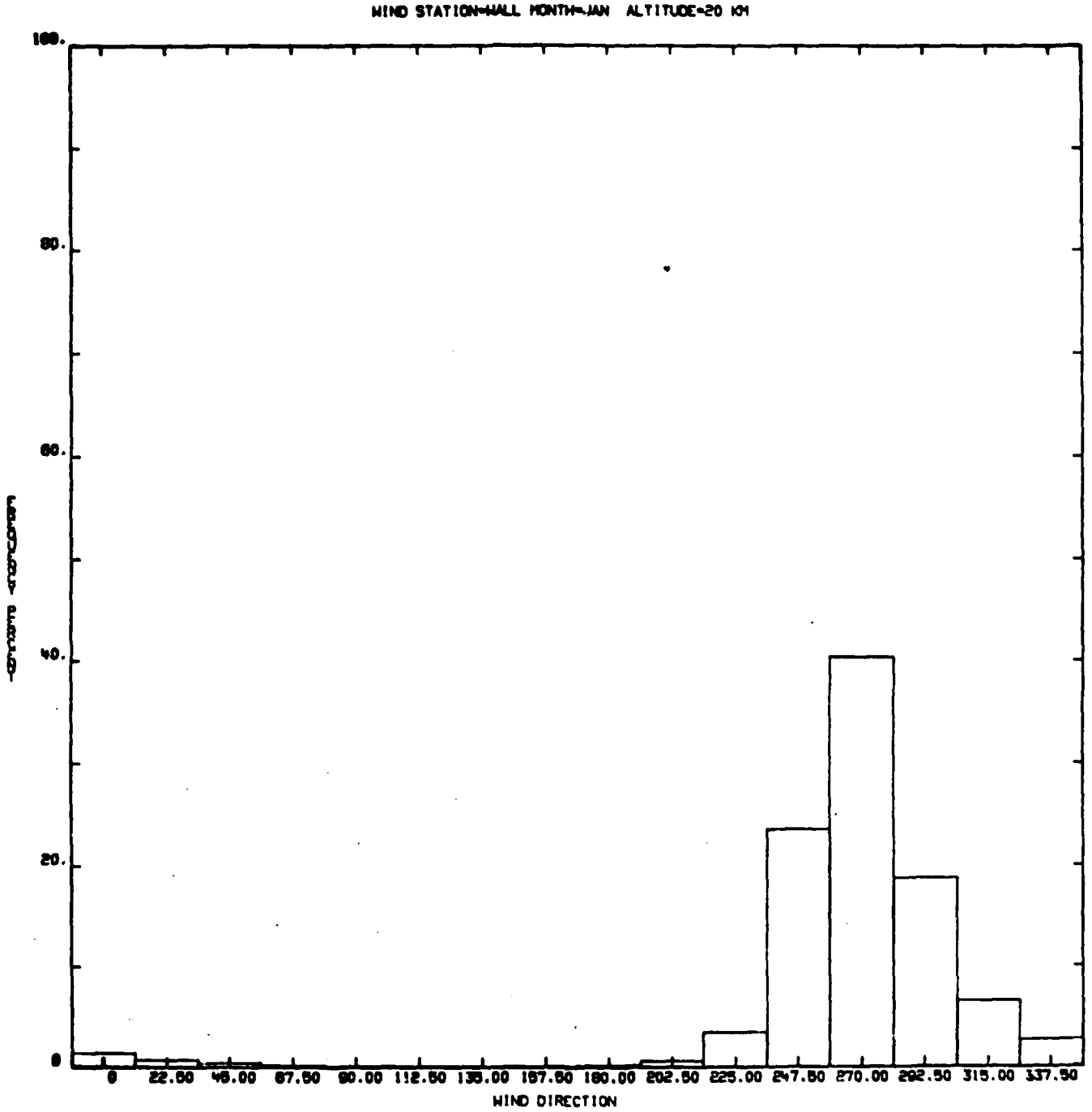
270.00
292.50
315.00
337.50
WIND DIRECTION

Figure A-2.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60.
40.
20.
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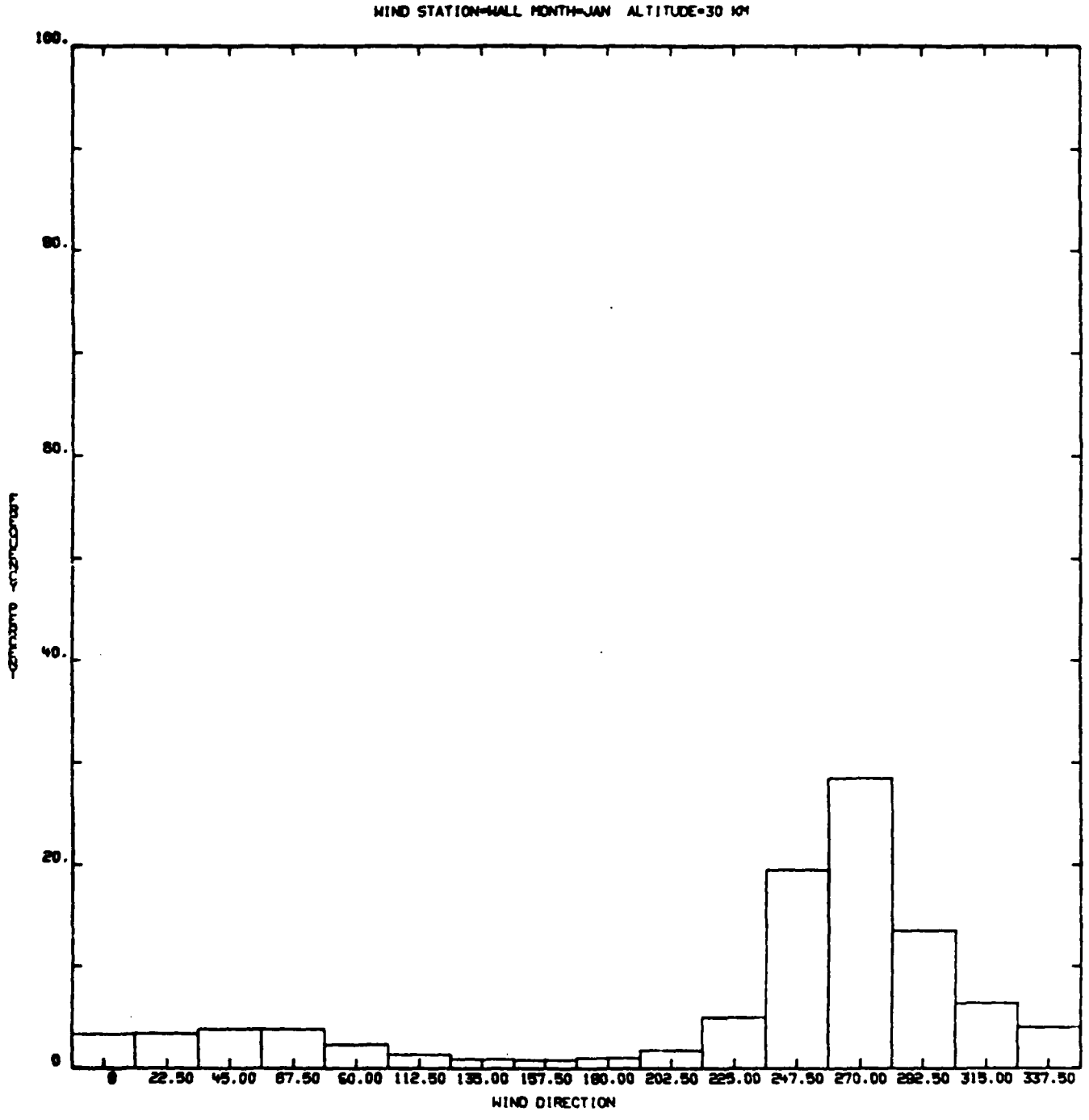
292.50
315.00
337.50
WIND DIRECTION

Figure A-3.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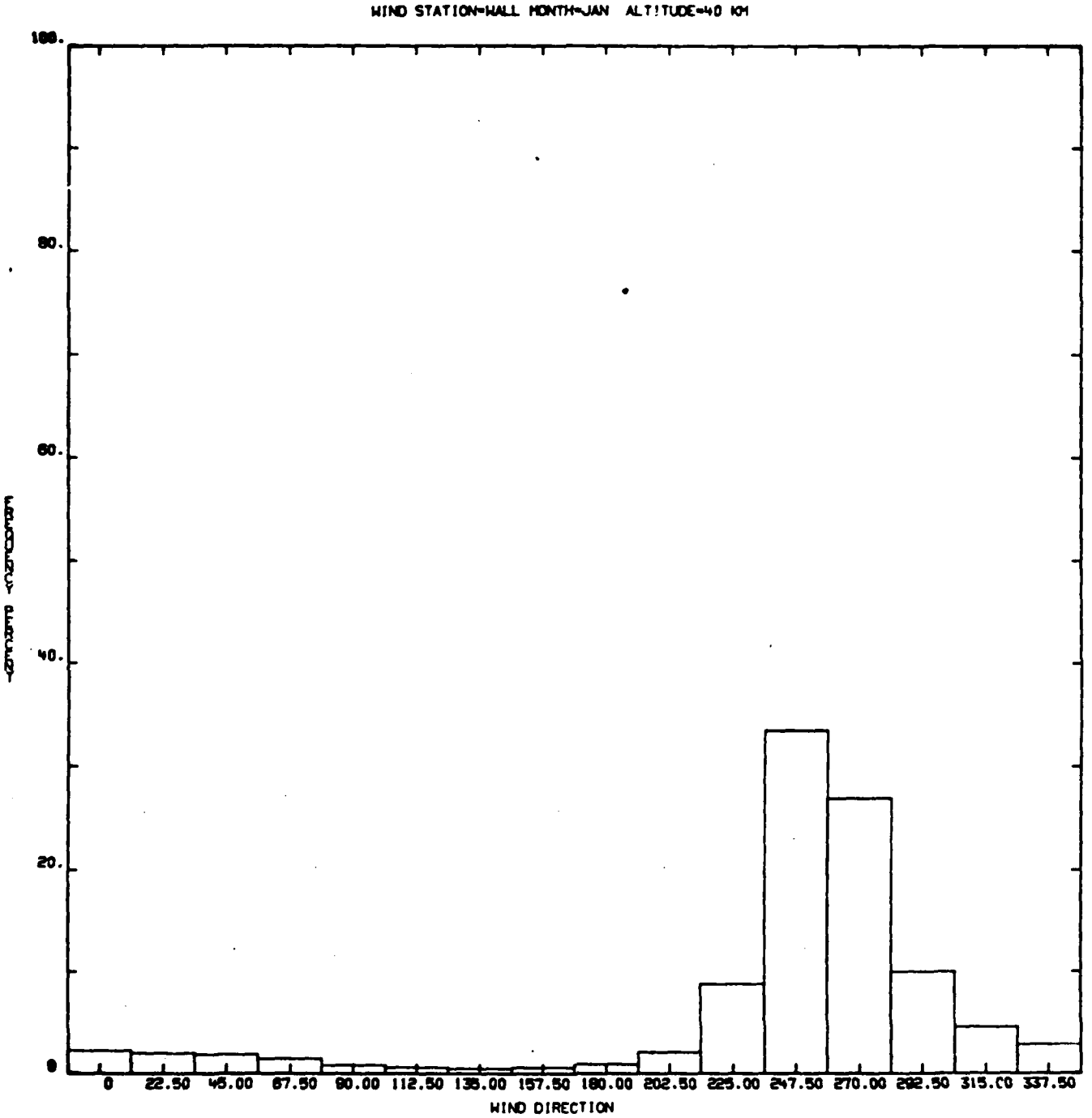
292.50
315.00
337.50
WIND DIRECTION

Figure A-4.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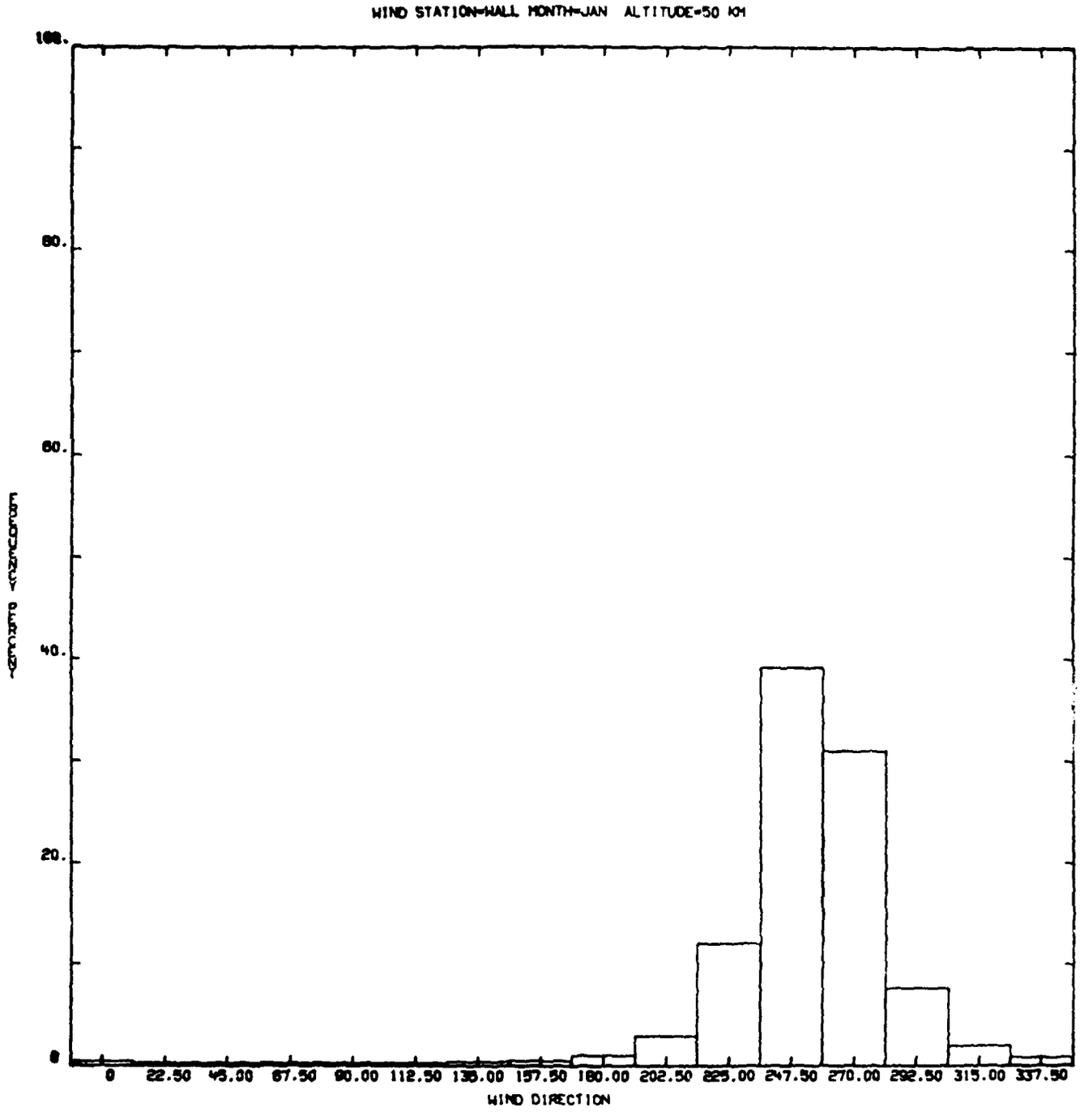
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Figure A-5.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60.
40.
20.
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0
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112.50
135.00
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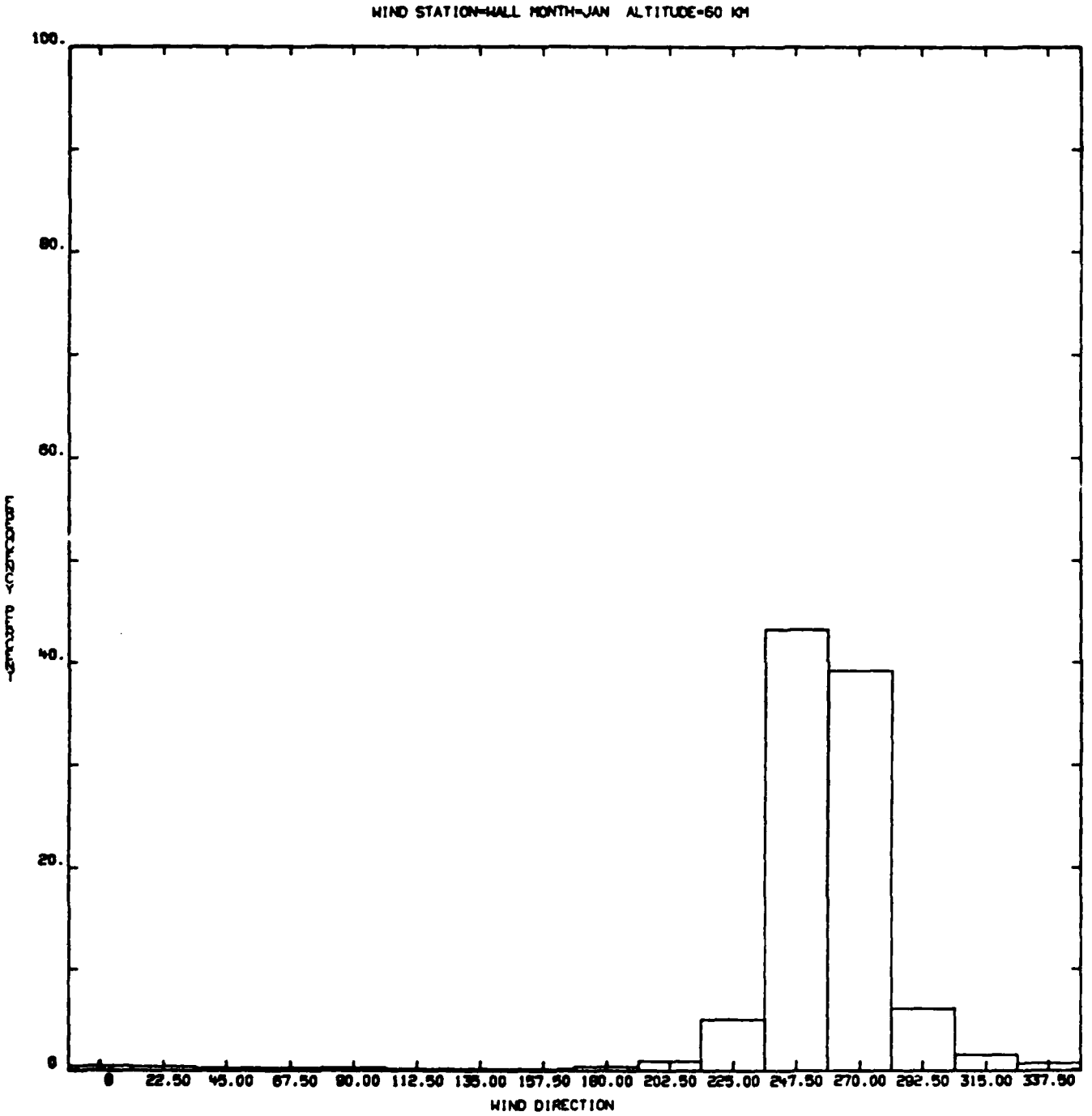
292.50
315.00
337.50
WIND DIRECTION

Figure A-6.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60.
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20.
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0
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112.50
135.00
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202.50
225.00
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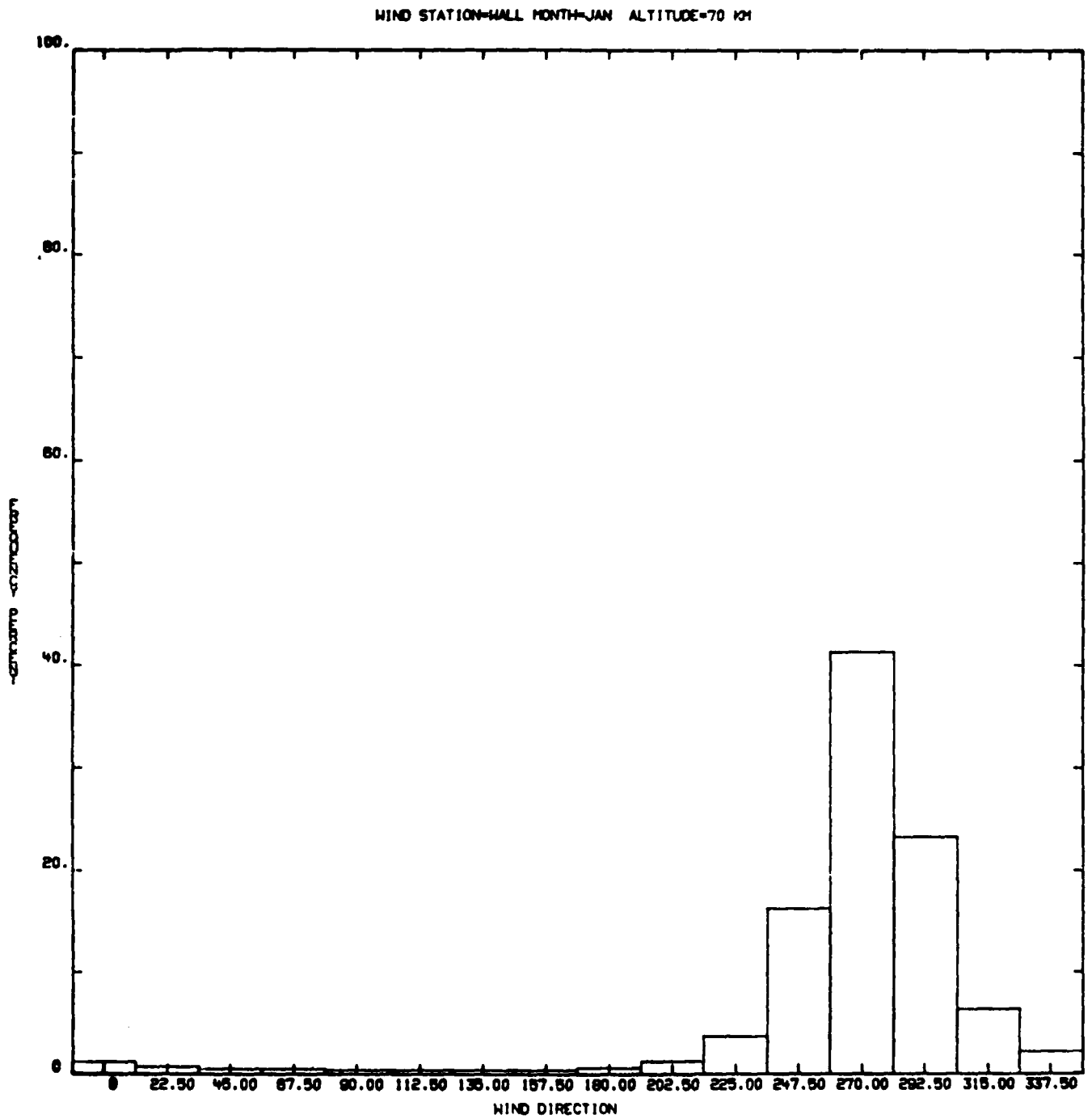
270.00
292.50
315.00
337.50
WIND DIRECTION

Figure A-7.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60.
40.
20.
0
0
22.50
45.00
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112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Figure A-8.

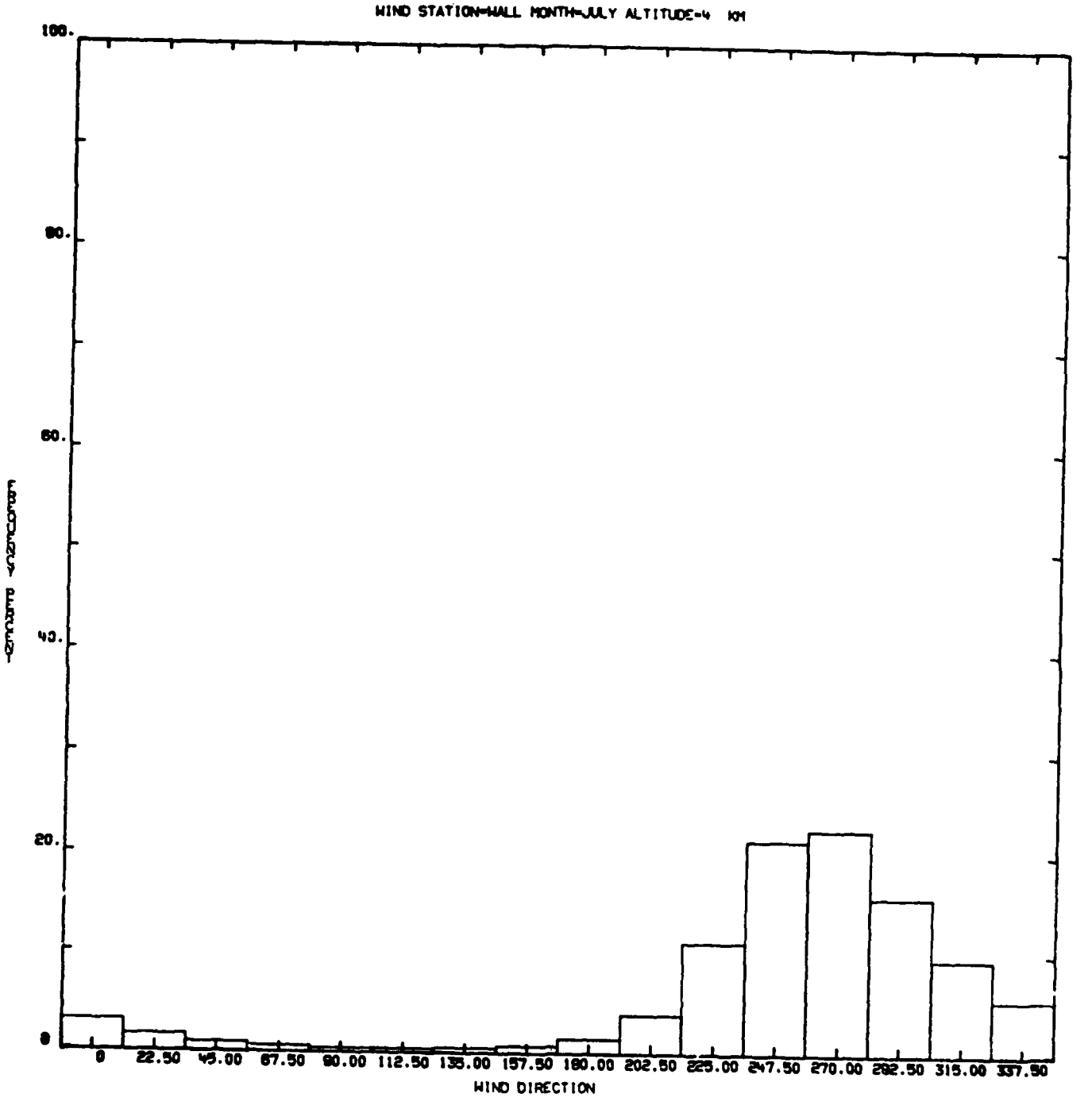

WIND STATION=HALL MONTH=JULY ALTITUDE=4 KM
100.
80.
60.
40.
20.
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Figure A-9.

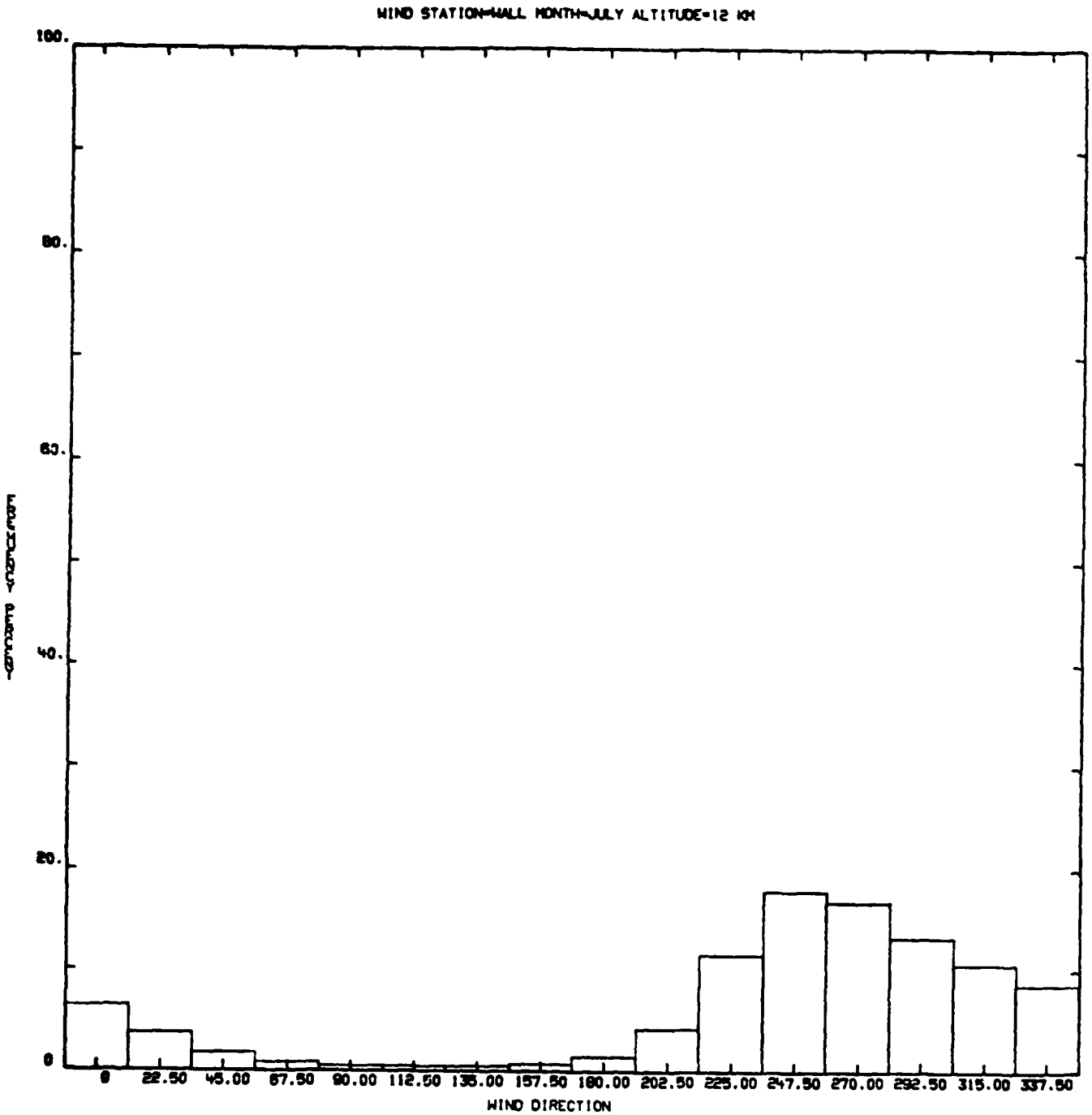

WIND STATION=HALL MONTH=JULY ALTITUDE=12 KM
100.
80.
60.
40.
20.
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Figure A-10.

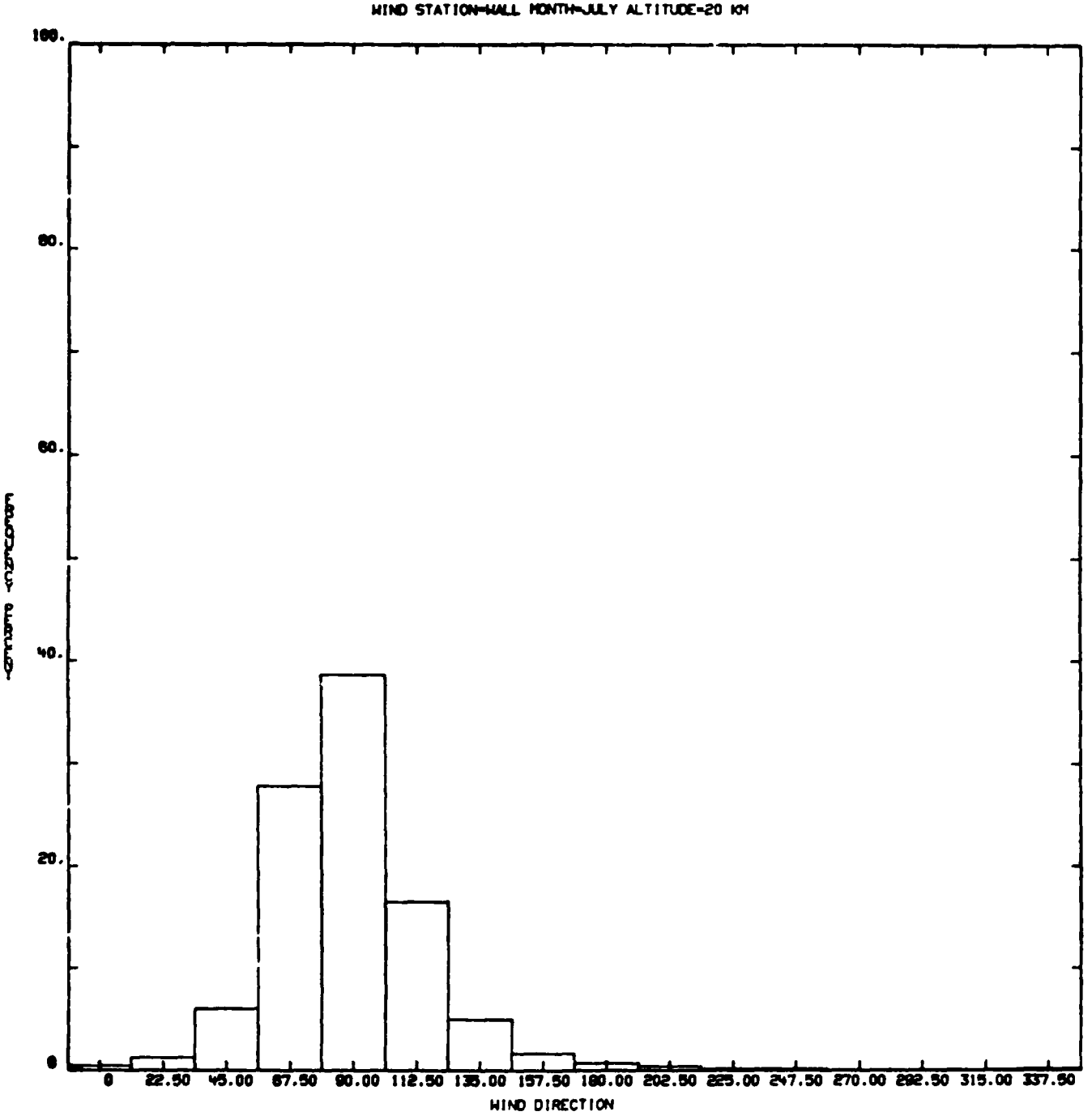

WIND STATION=HALL MONTH=JULY ALTITUDE=20 KM
100.
80.
60.
40.
20.
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Figure A-11.

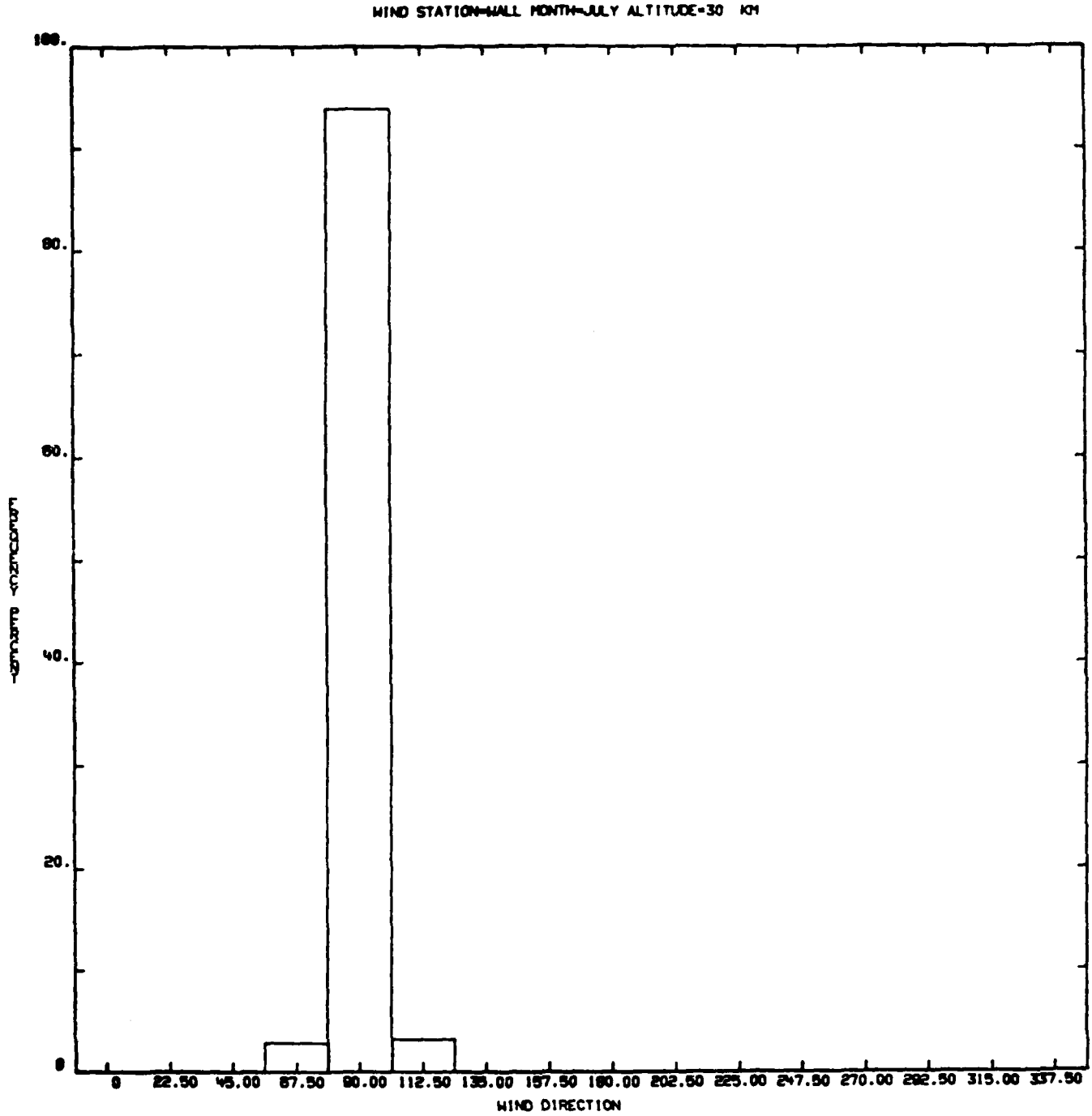

WIND STATION=WALL MONTH=JULY ALTITUDE=30 KM
100.
80.
60.
40.
20.
0
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Figure A-12.

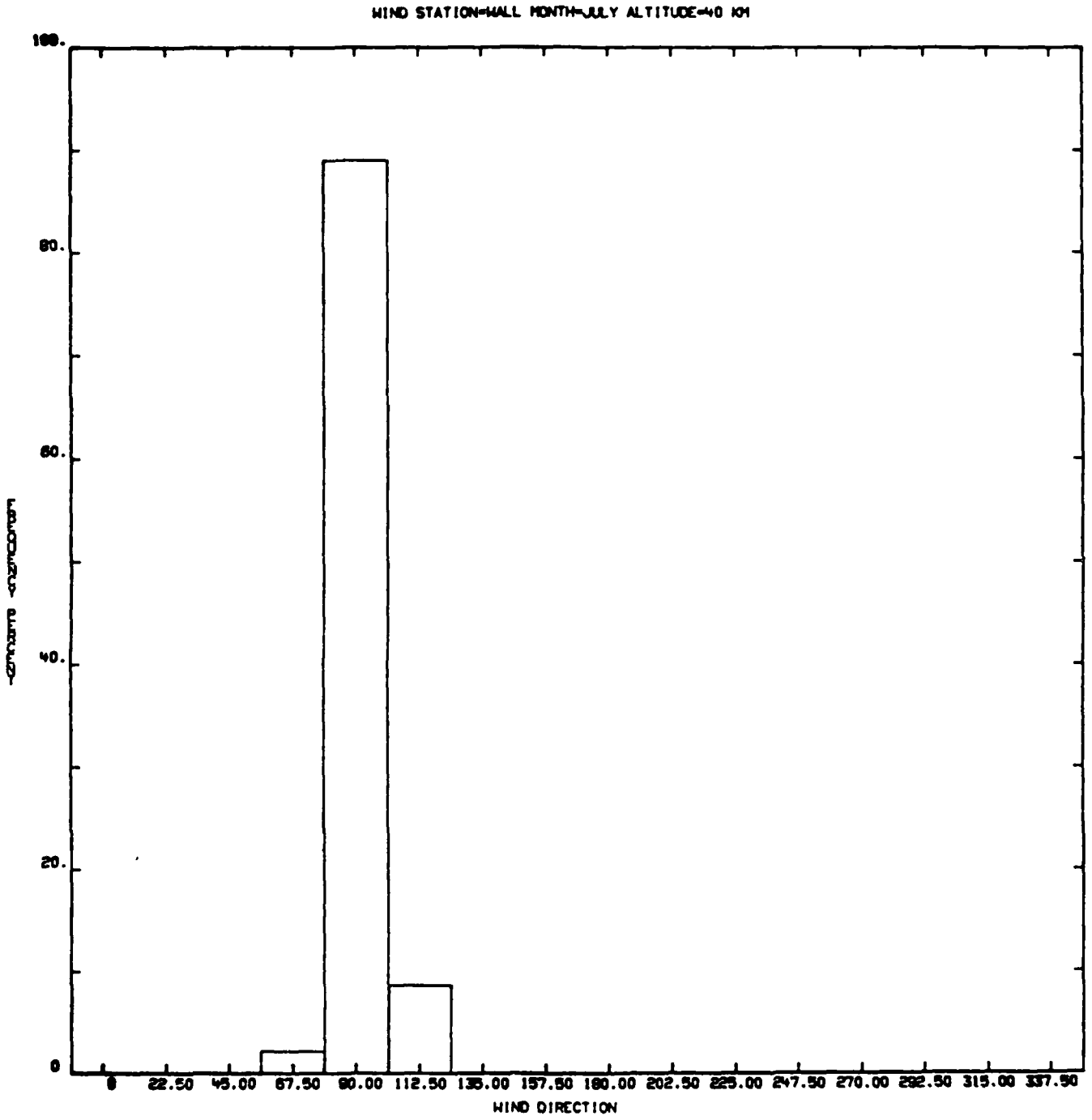

WIND STATION=WALL MONTH=JULY ALTITUDE=40 KM
100.
80.
60.
40.
20.
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Figure A-13.

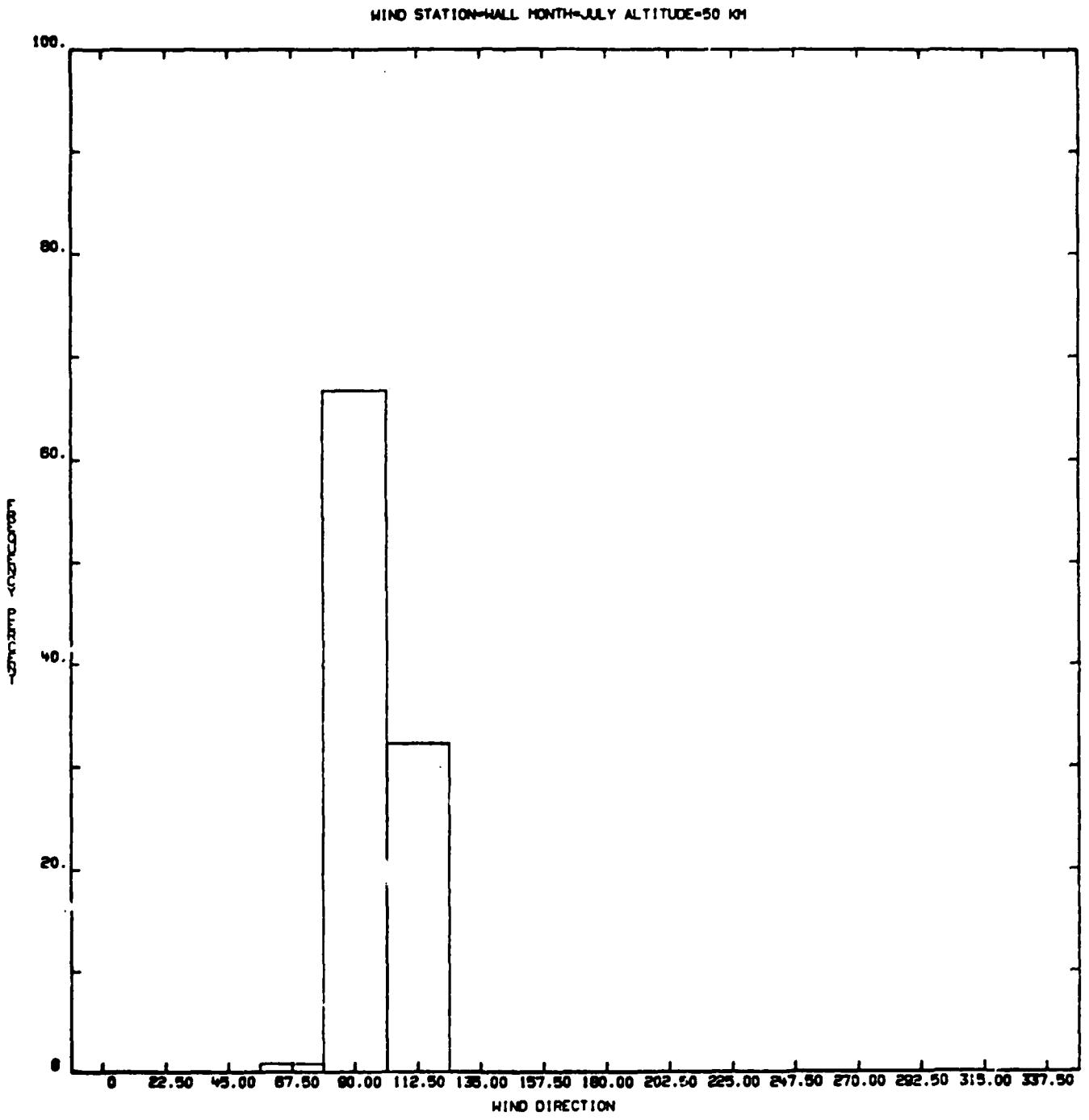

WIND STATION=HALL MONTH=JULY ALTITUDE=50 KM
100.
80.
60.
40.
20.
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Figure A-14.

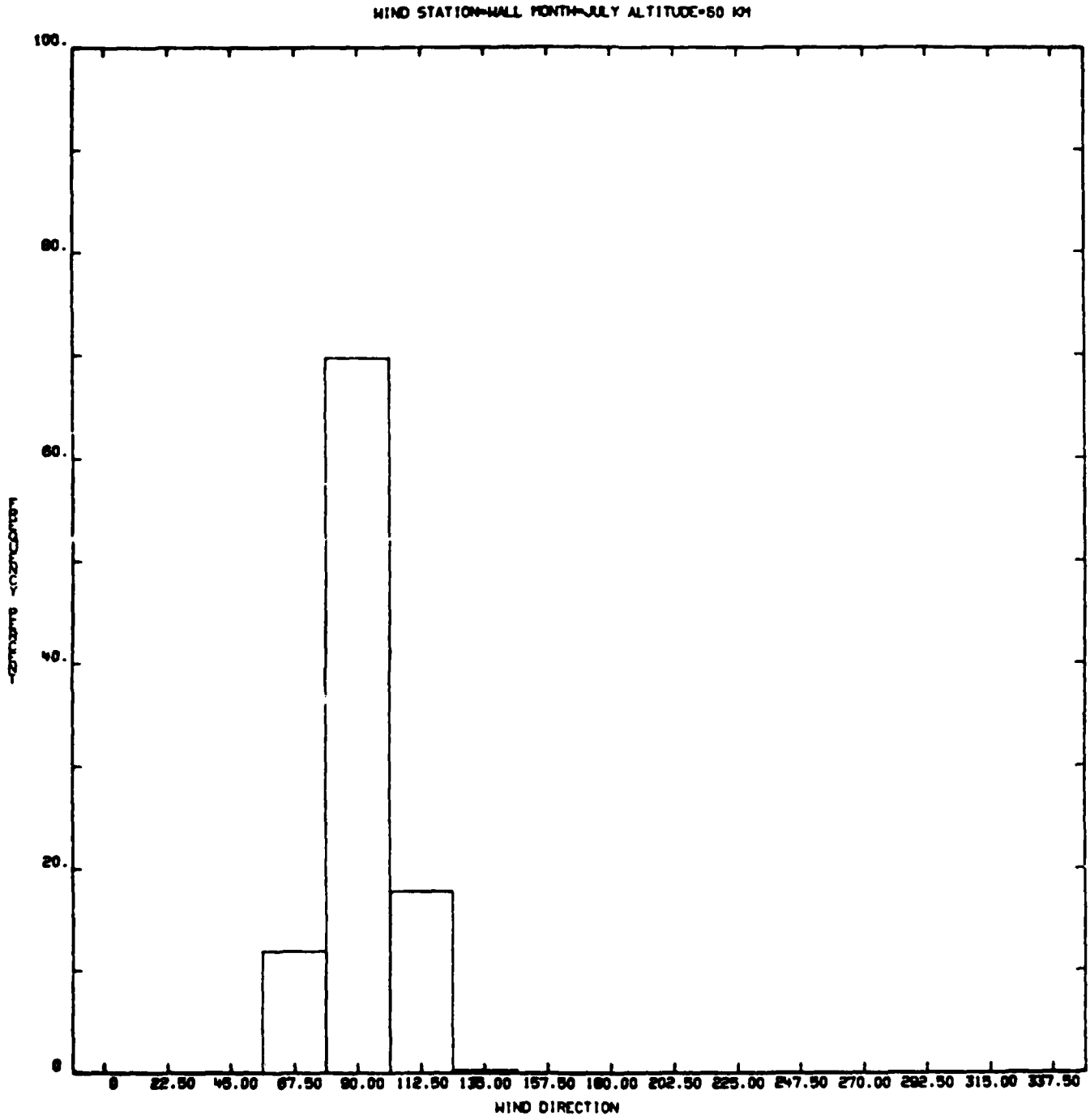

WIND STATION=WALL MONTH=JULY ALTITUDE=60 KM
100.
80.
60.
40.
20.
0
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Figure A-15.

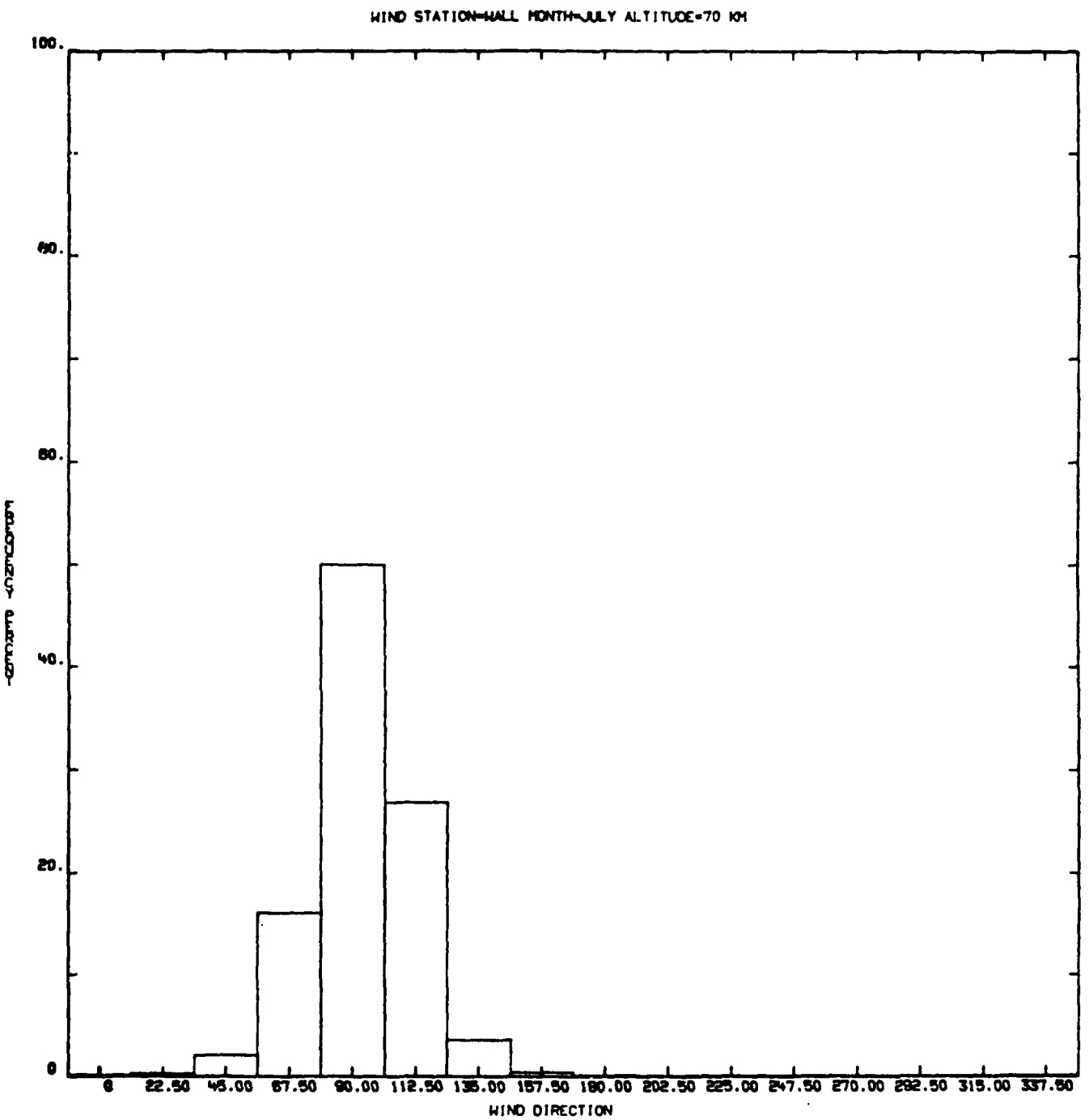

WIND STATION=HALL MONTH=JULY ALTITUDE=70 KM
100.
80.
60.
40.
20.
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Figure A-16.

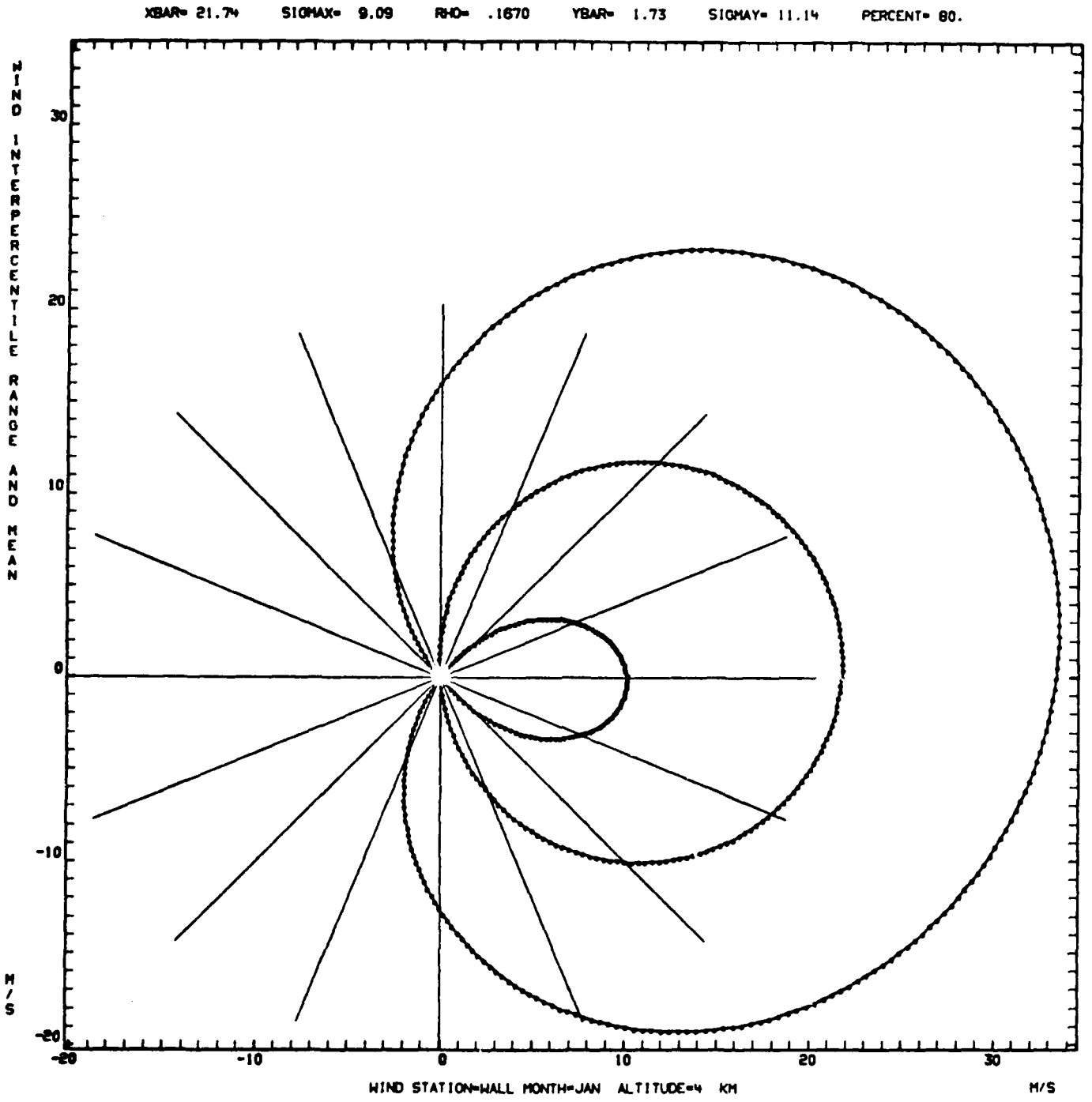

XBAR= 21.74 SIGMAX= 9.09 RHO= .1670 YBAR= 1.73 SIGMAY= 11.14 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
30
20
10
0
-10
-20
-20
-10
0
10
20
30
WIND STATION=WALL MONTH=JAN ALTITUDE=4 KM
M/S

Figure A-17.

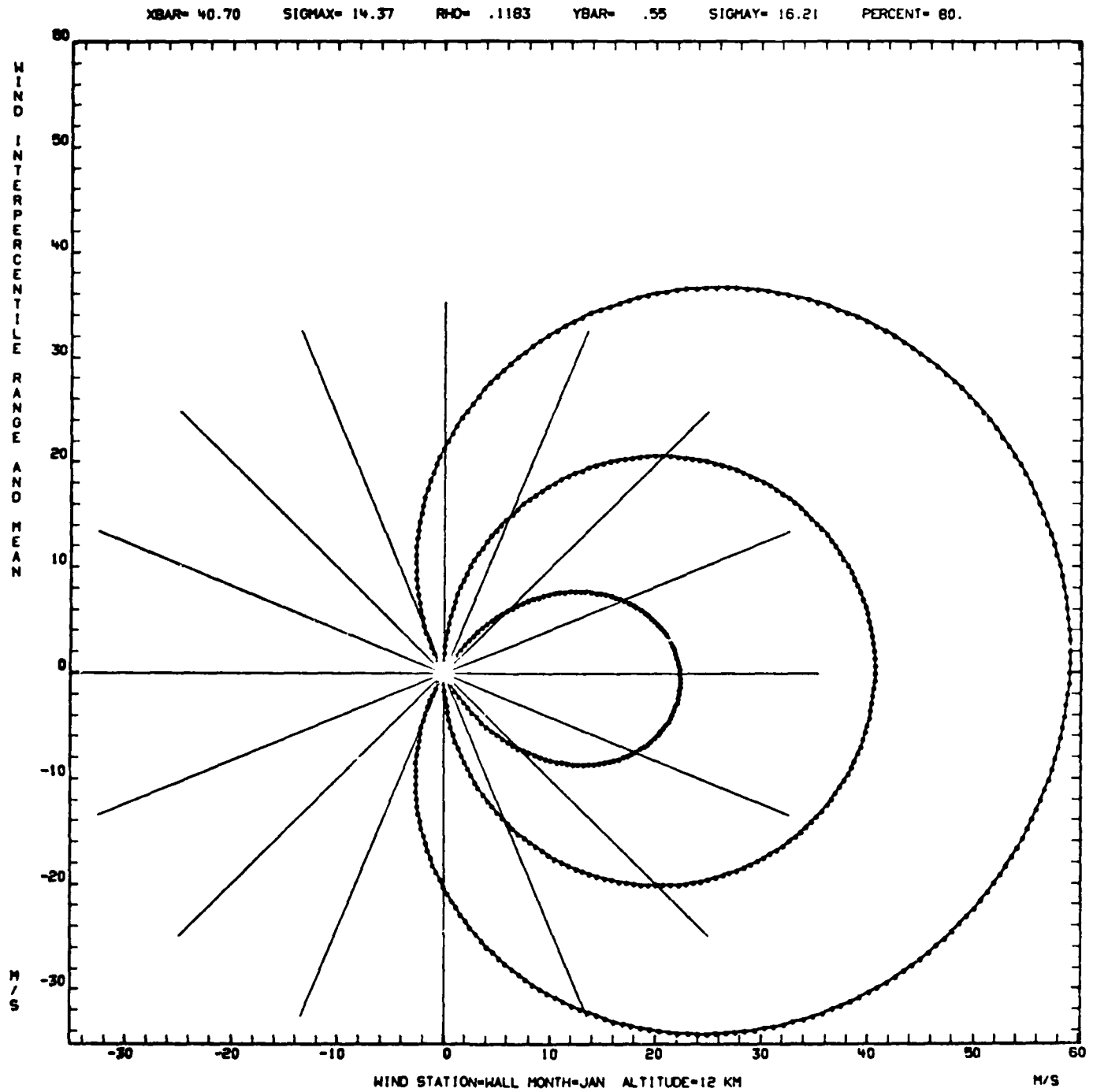

XBAR= 40.70 SIGMAX= 14.37 RHO= .1183 YBAR= .55 SIGMAY= 16.21 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
60
50
40
30
20
10
0
-10
-20
-30
-30 -20 -10 0 10 20 30 40 50 60
WIND STATION=WALL MONTH=JAN ALTITUDE=12 KM
M/S

Figure A-18.

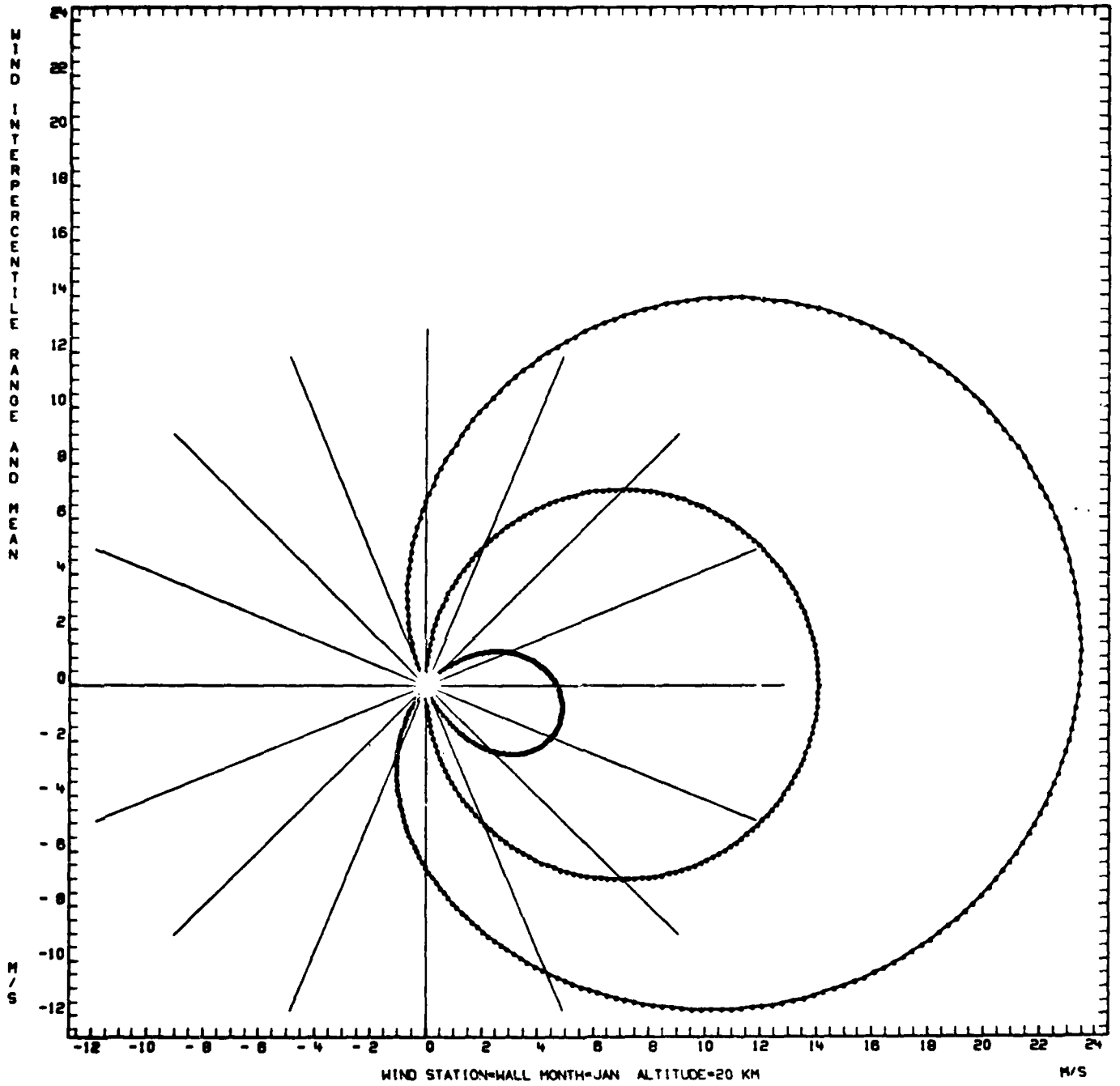

XBAR= 14.07 SIGMAX= 7.31 RHO= .3469 YBAR= .04 SIGMAY= 5.15 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
WIND STATION=WALL MONTH=JAN ALTITUDE=20 KM
M/S

Figure A-19.

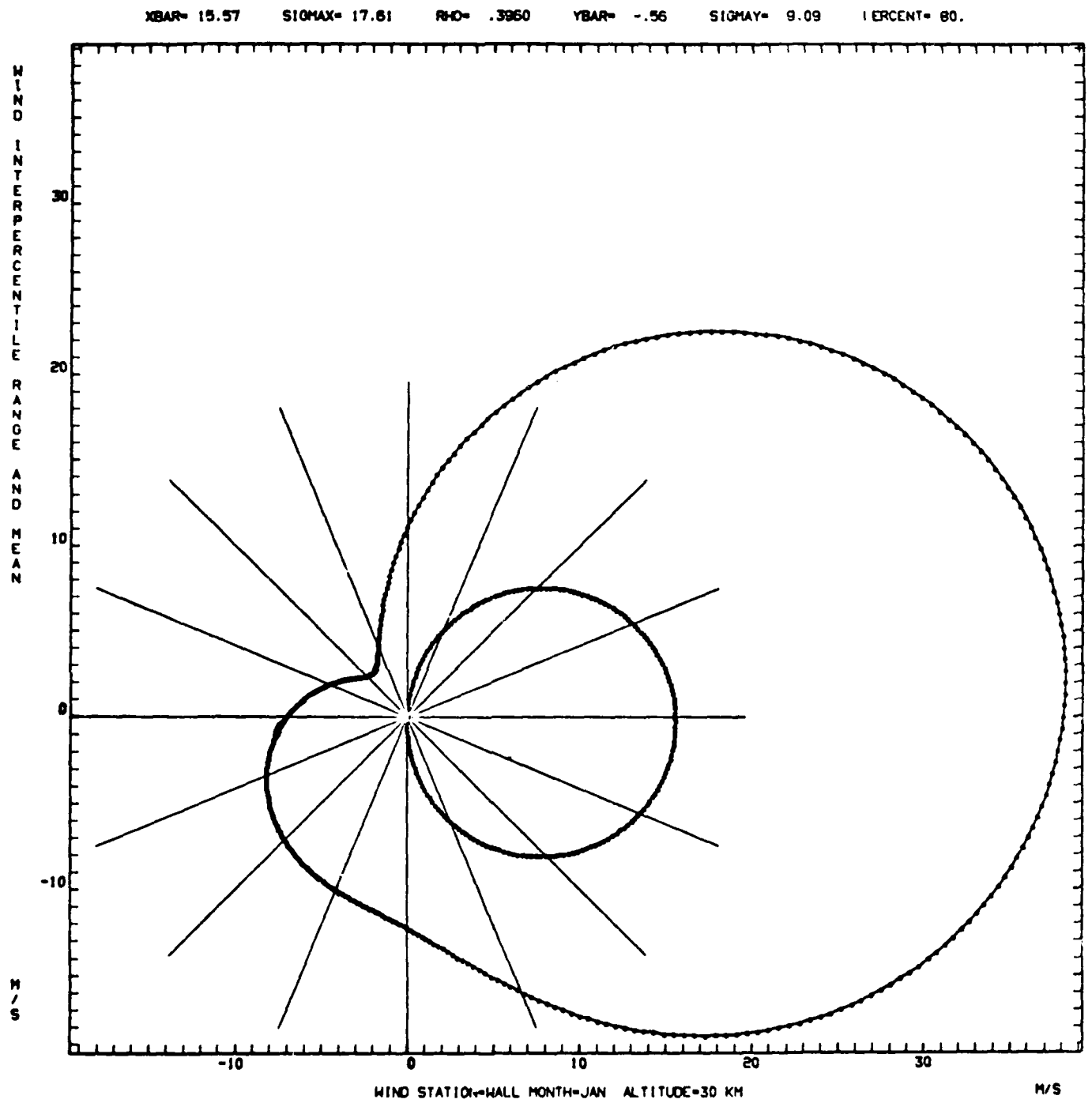

XBAR= 15.57 SIGMAX= 17.61 RHO= .3960 YBAR= -.56 SIGMAY= 9.09 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
30
20
10
0
-10
M/S
-10
0
10
20
30
WIND STATION=HALL MONTH=JAN ALTITUDE=30 KM
M/S

Figure A-20.

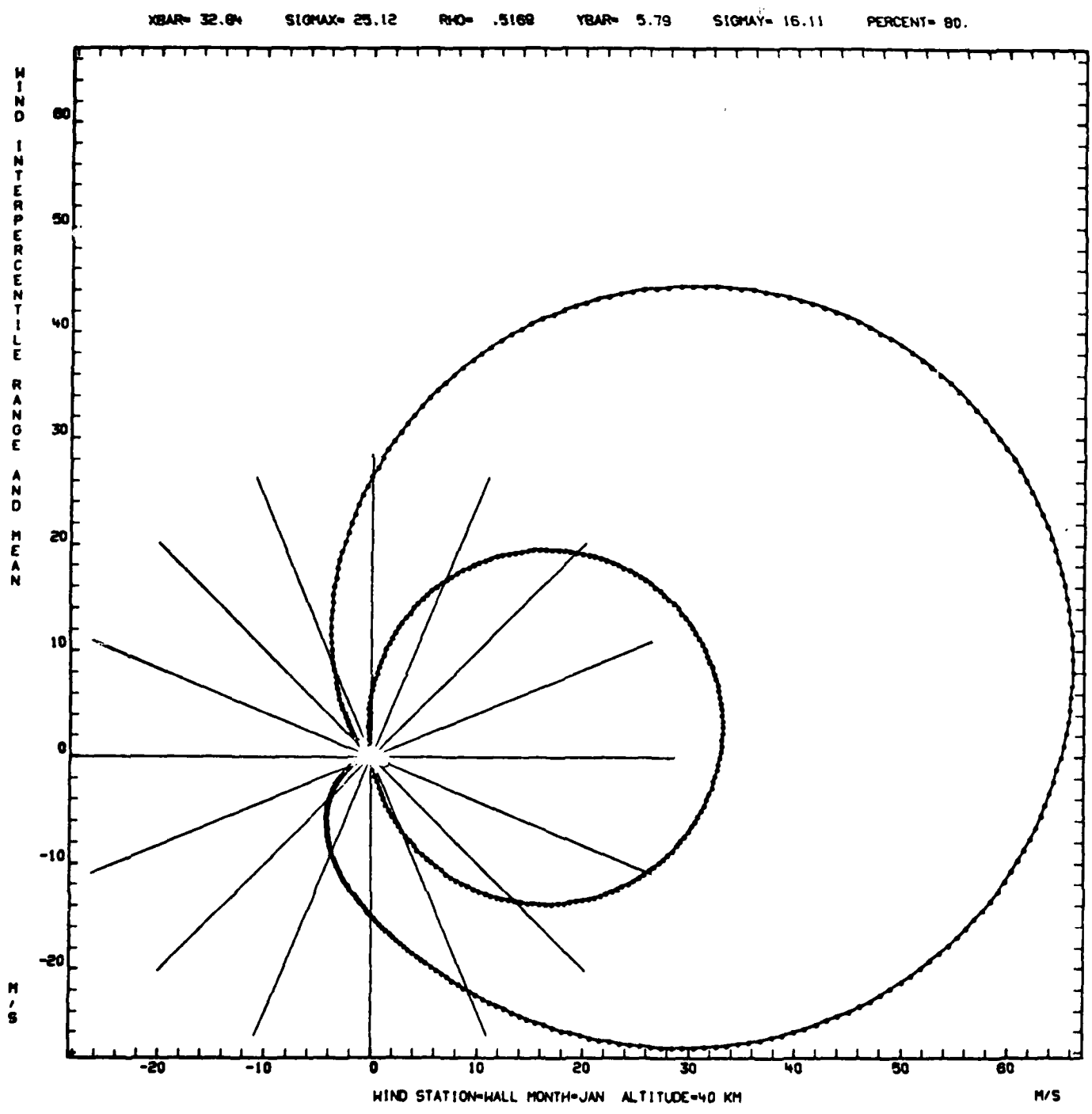

XBAR= 32.84 SIGMAX= 25.12 RHO= .5168 YBAR= 5.79 SIGMAY= 16.11 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
60
50
40
30
20
10
0
-10
-20
-20 -10 0 10 20 30 40 50 60
WIND STATION=WALL MONTH=JAN ALTITUDE=40 KM
M/S

Figure A-21.

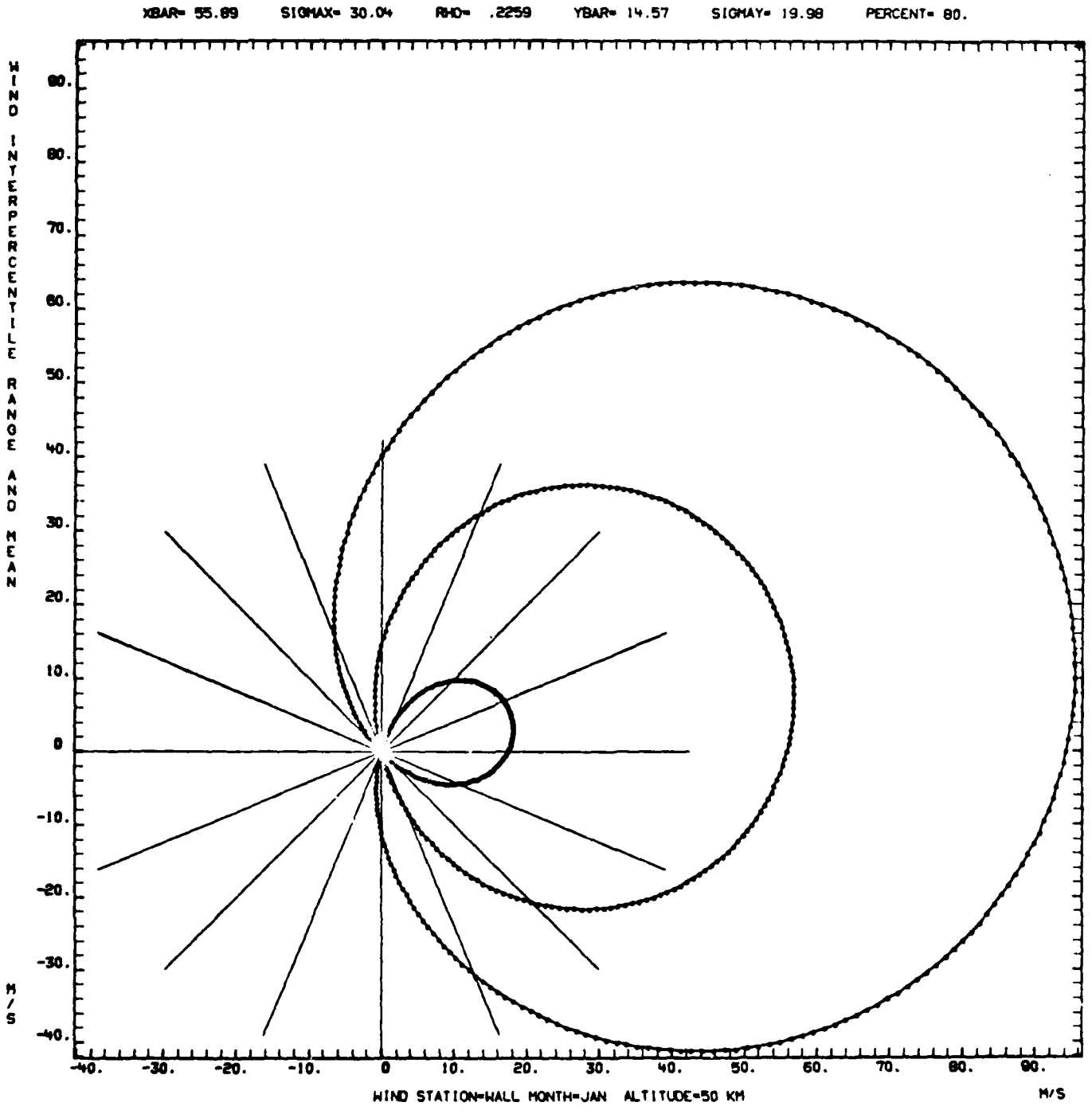

XBAR= 55.89 SIGMAX= 30.04 RHO= .2259 YBAR= 14.57 SIGMAY= 19.98 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
90.
80.
70.
60.
50.
40.
30.
20.
10.
0
-10.
-20.
-30.
-40.
-40. -30. -20. -10. 0 10. 20. 30. 40. 50. 60. 70. 80. 90.
WIND STATION=WALL MONTH=JAN ALTITUDE=50 KM
M/S

Figure A-22.

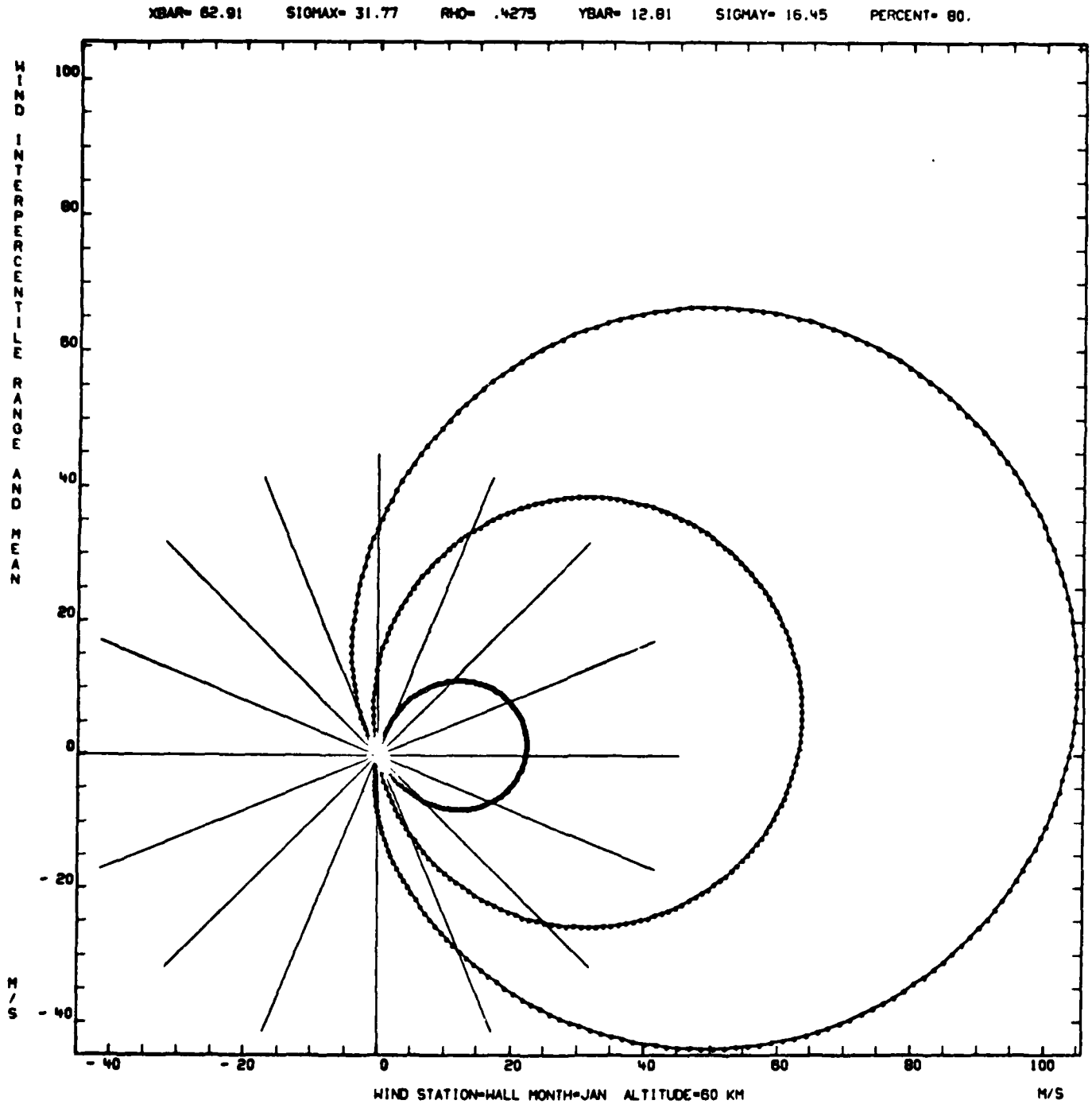

XBAR= 62.91 SIGMAX= 31.77 RHO= .4275 YBAR= 12.81 SIGMAY= 16.45 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
100
80
60
40
20
0
- 20
- 40
- 40
- 20
0
20
40
60
80
100
WIND STATION=HALL MONTH=JAN ALTITUDE=60 KM
M/S

Figure A-23.

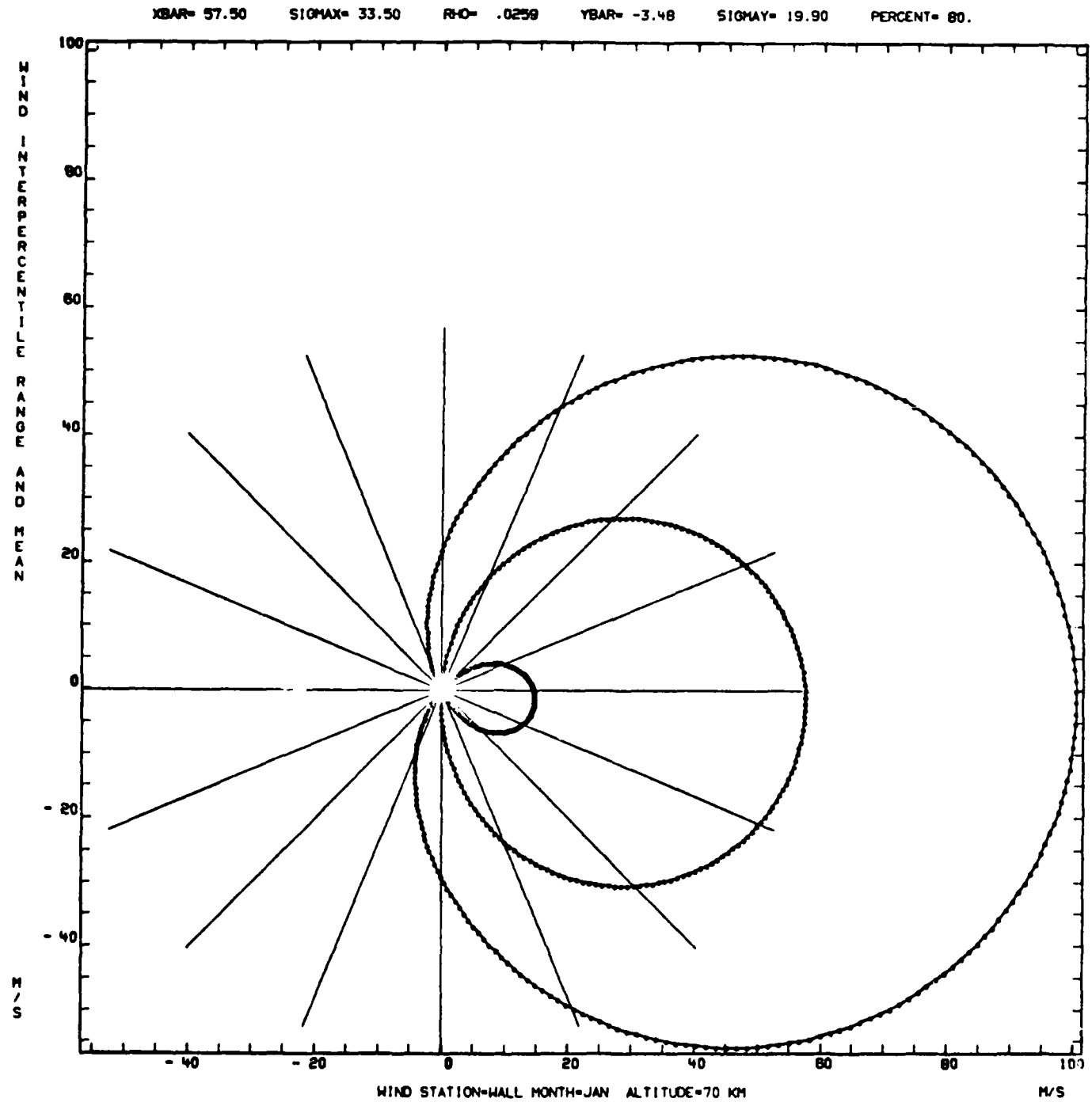

XBAR= 57.50 SIGMAX= 33.50 RHO= .0259 YBAR= -3.48 SIGMAY= 19.90 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
100
80
60
40
20
0
- 20
- 40
- 40
- 20
0
20
40
60
80
100
WIND STATION=WALL MONTH=JAN ALTITUDE=70 KM
M/S

Figure A-24.

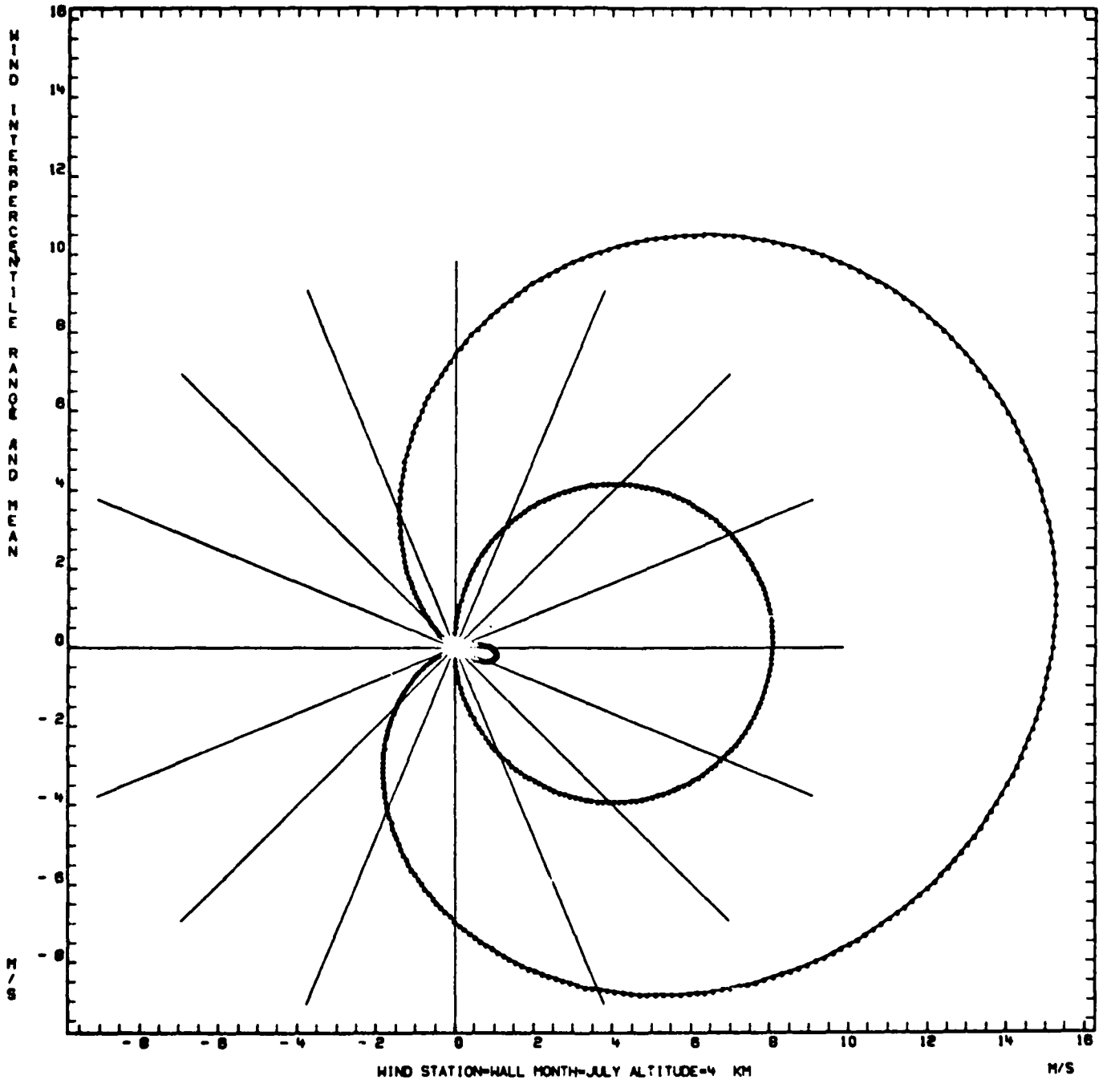

XBAR= 0.07 SIGMAX= 5.56 RHO= .2404 YBAR= .25 SIGMAY= 5.61 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
WIND STATION=HALL MONTH=JULY ALTITUDE=4 KM
M/S

Figure A-25.

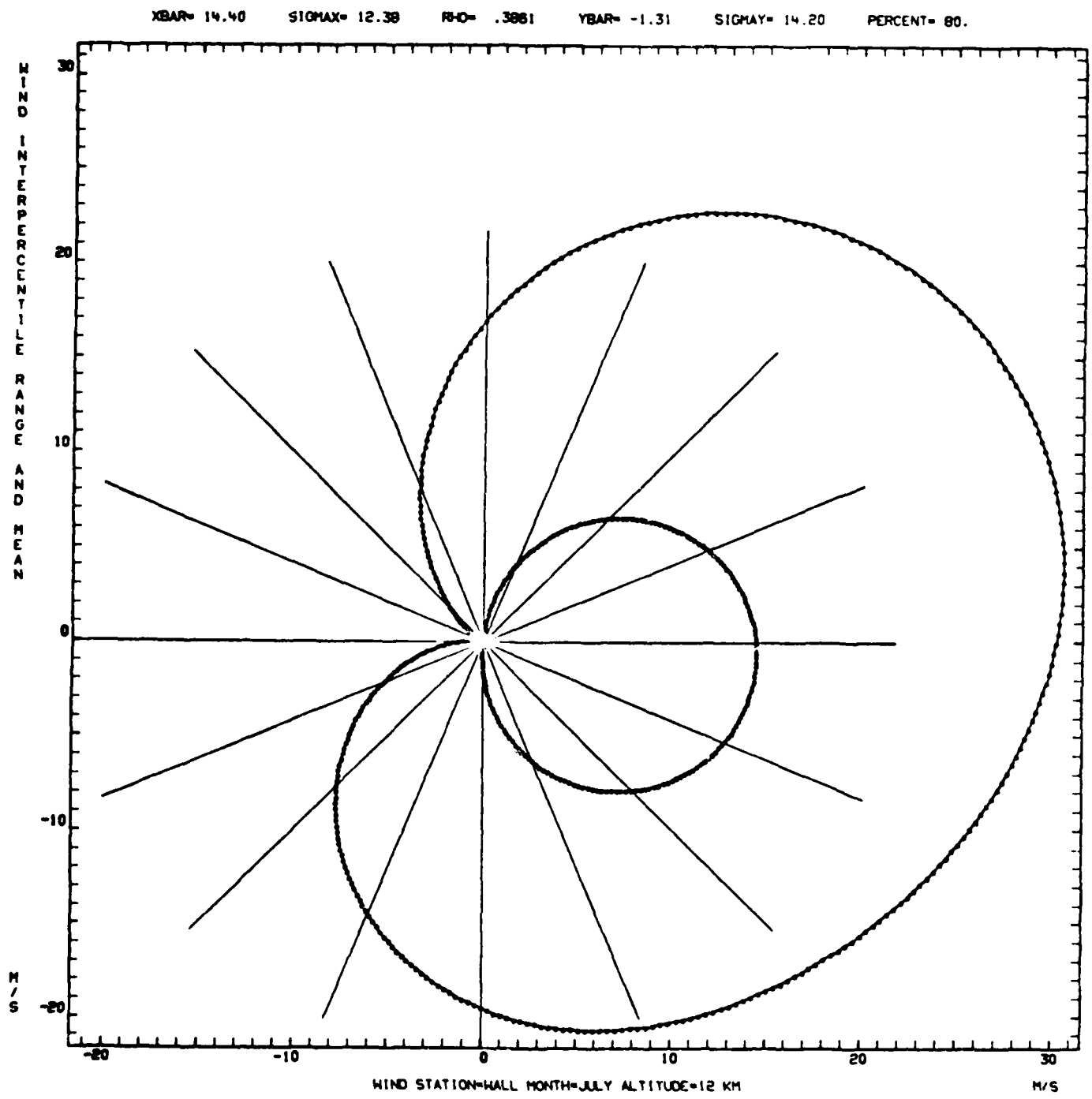

XBAR= 14.40 SIGMAX= 12.38 RHO= .3861 YBAR= -1.31 SIGMAY= 14.20 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
30
20
10
0
-10
-20
-20
-10
0
10
20
30
WIND STATION=HALL MONTH=JULY ALTITUDE=12 KM
M/S

Figure A-26.

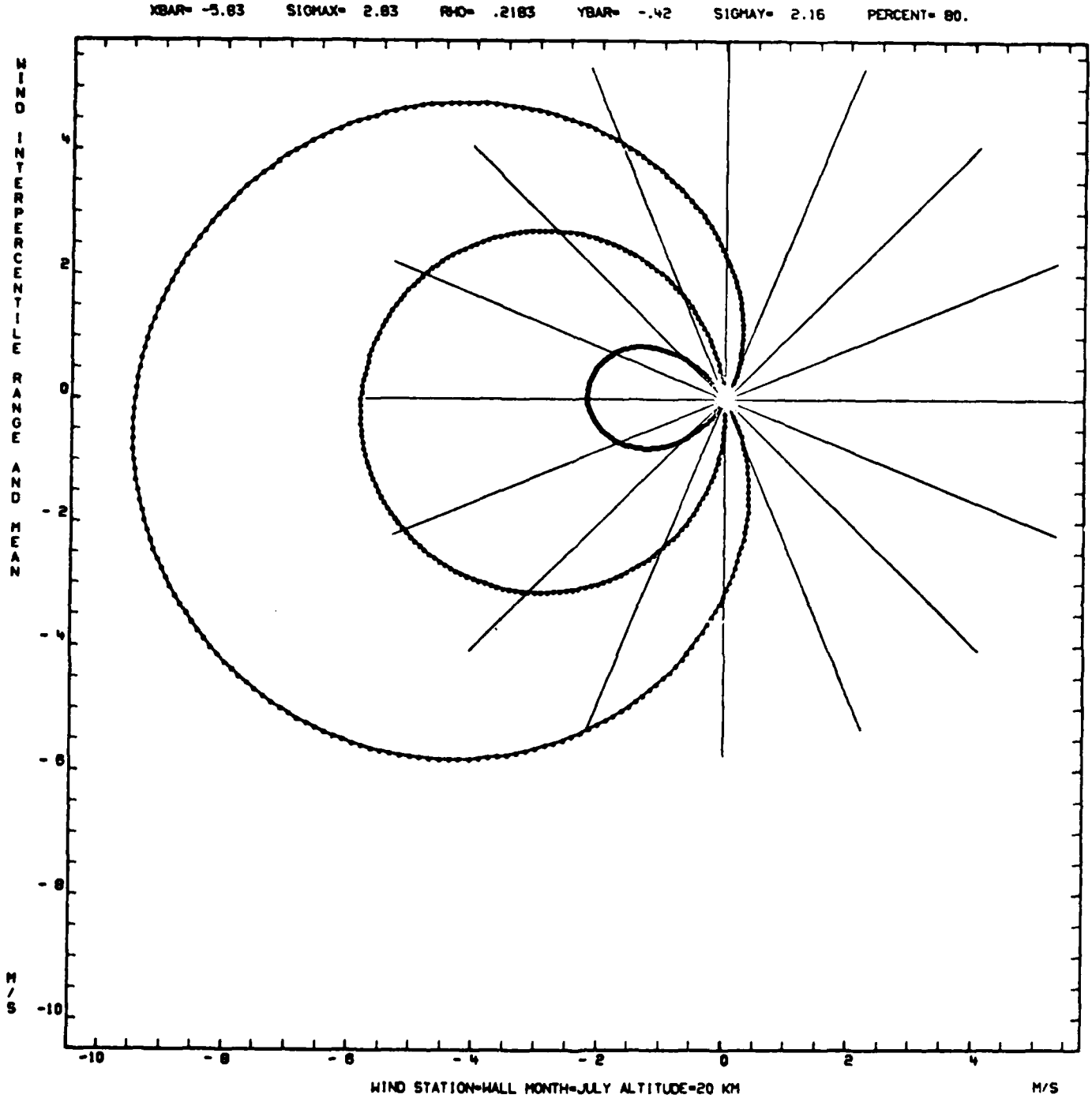

XBAR= -5.83 SIGMAX= 2.83 RHO= .2183 YBAR= -.42 SIGMAY= 2.16 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
4
2
0
-2
-4
-6
-8
-10
-10 -8 -6 -4 -2 0 2 4
WIND STATION=WALL MONTH=JULY ALTITUDE=20 KM
M/S

Figure A-27.

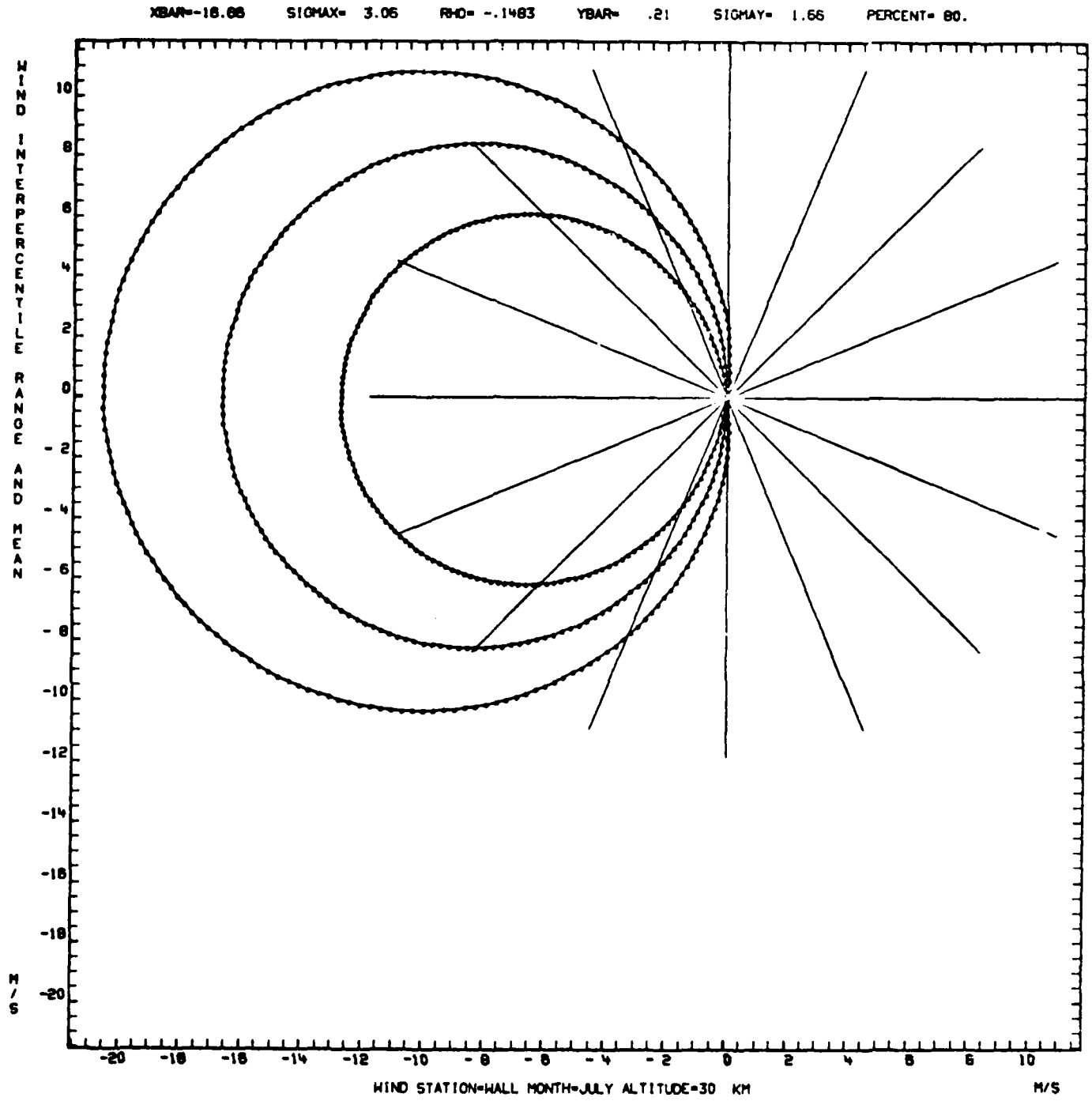

XBAR=-18.88 SIGMAX= 3.06 RHO= -.1483 YBAR= .21 SIGMAY= 1.66 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10
WIND STATION=HALL MONTH=JULY ALTITUDE=30 KM
M/S

Figure A-28.

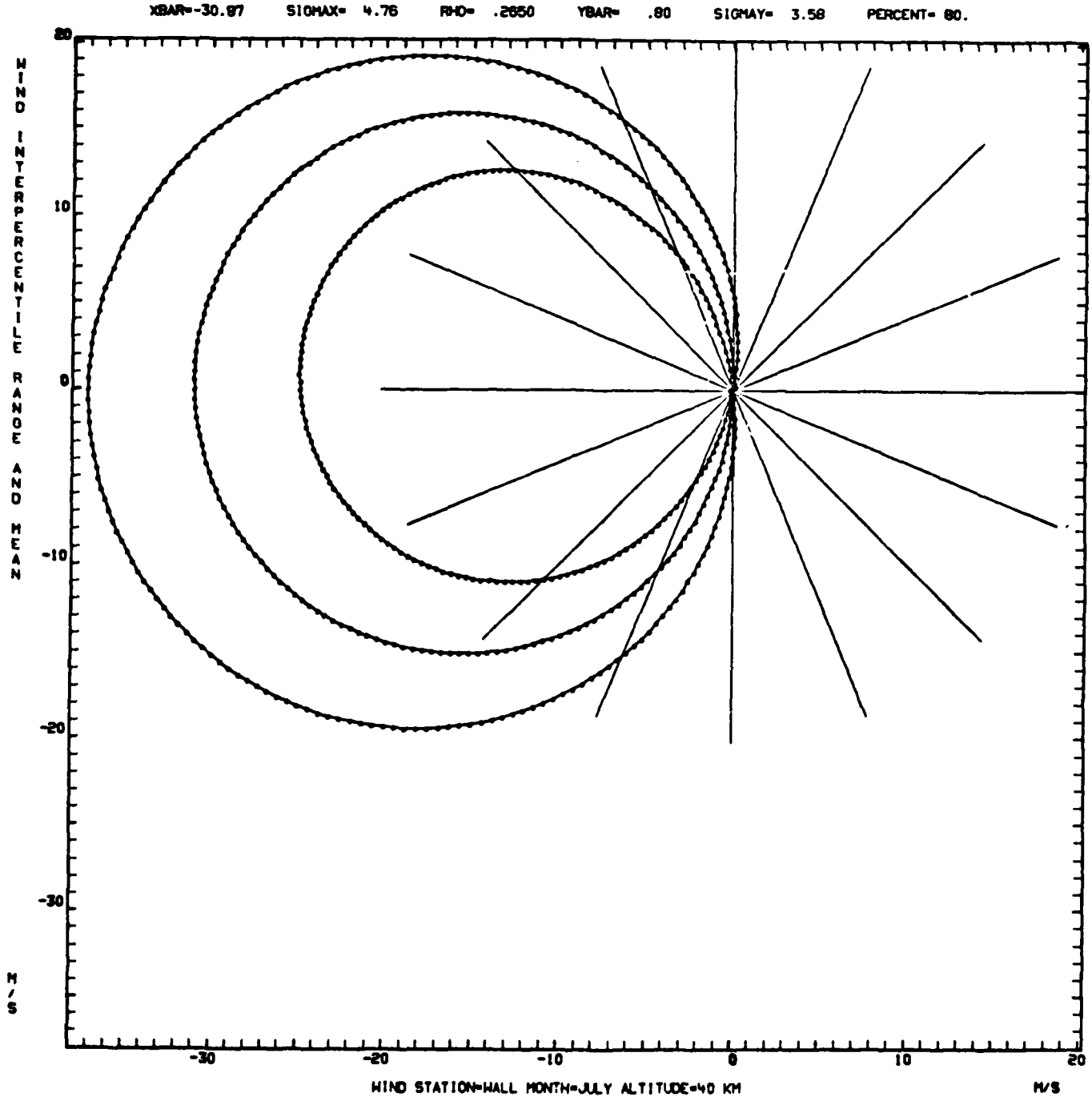

XBAR=-30.97 SIGMAX= 4.76 RHO= .2650 YBAR= .80 SIGMAY= 3.58 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
20
10
0
-10
-20
-30
-30
-20
-10
0
10
20
WIND STATION=WALL MONTH=JULY ALTITUDE=40 KM
M/S

Figure A-29.

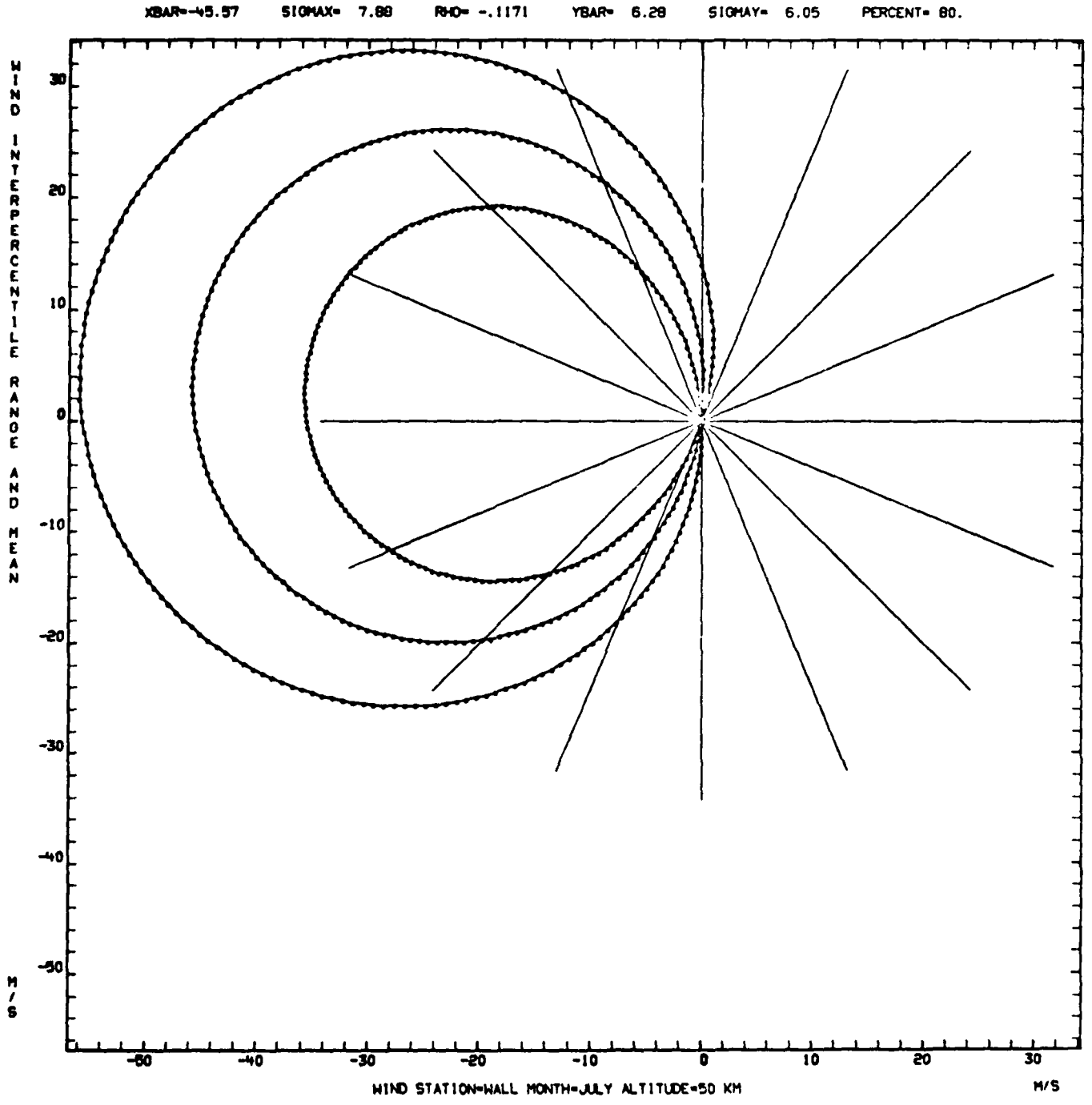

XBAR=-45.57 SIGMAX= 7.88 RHO= -.1171 YBAR= 6.28 SIGMAY= 6.05 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
30
20
10
0
-10
-20
-30
-40
-50
-60
-40
-30
-20
-10
0
10
20
30
WIND STATION=WALL MONTH=JULY ALTITUDE=50 KM
M/S

Figure A-30.

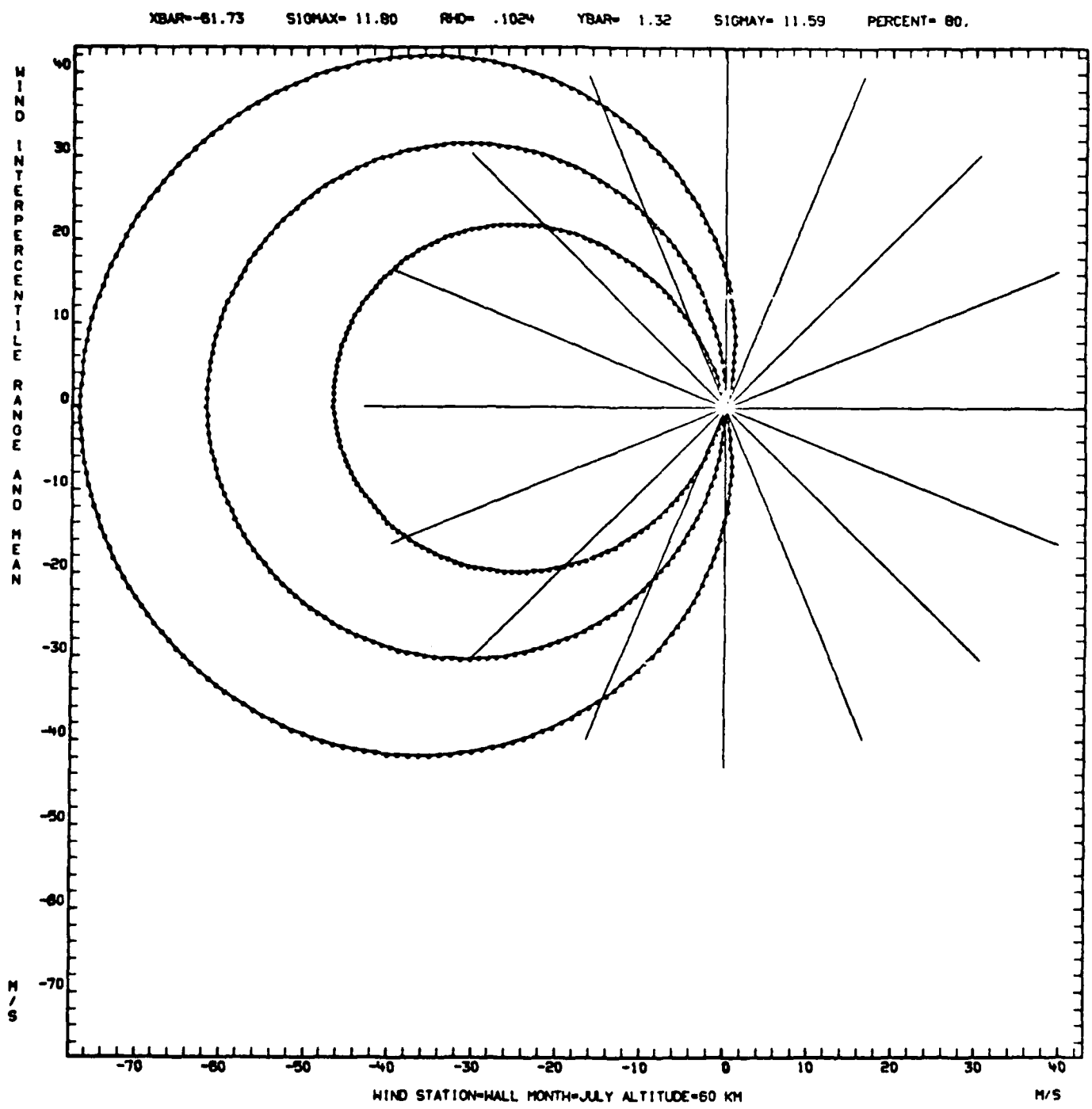

XBAR=-61.73 SIGMAX= 11.80 RHO= .1024 YBAR= 1.32 SIGMAY= 11.59 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-70 -60 -50 -40 -30 -20 -10 0 10 20 30 40
WIND STATION=WALL MONTH=JULY ALTITUDE=60 KM
M/S

Figure A-31.

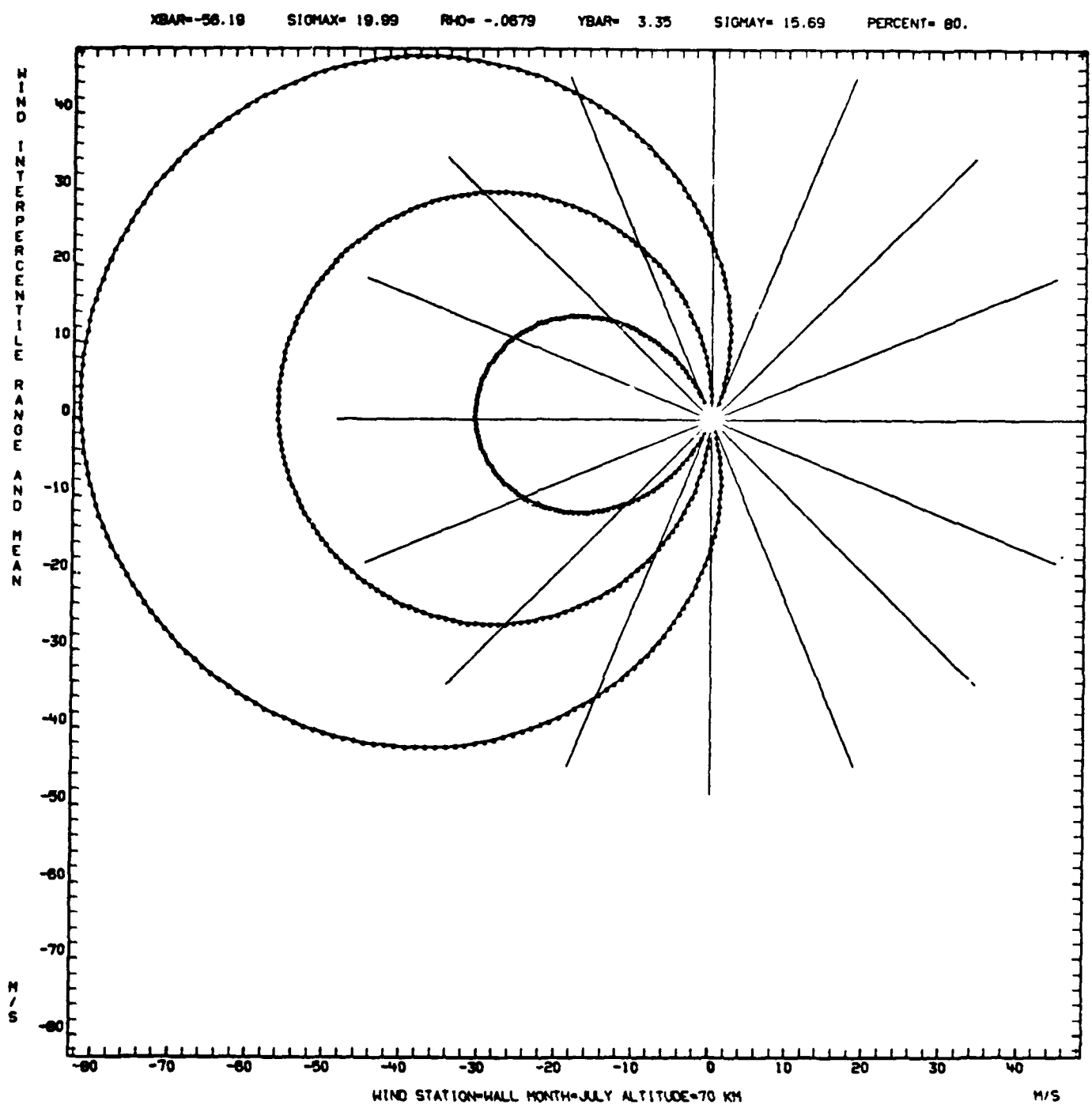

XBAR=-56.19 SIGMAX= 19.99 RHO= -.0679 YBAR= 3.35 SIGMAY= 15.69 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40
WIND STATION=WALL MONTH=JULY ALTITUDE=70 KM
M/S

Figure A-32.

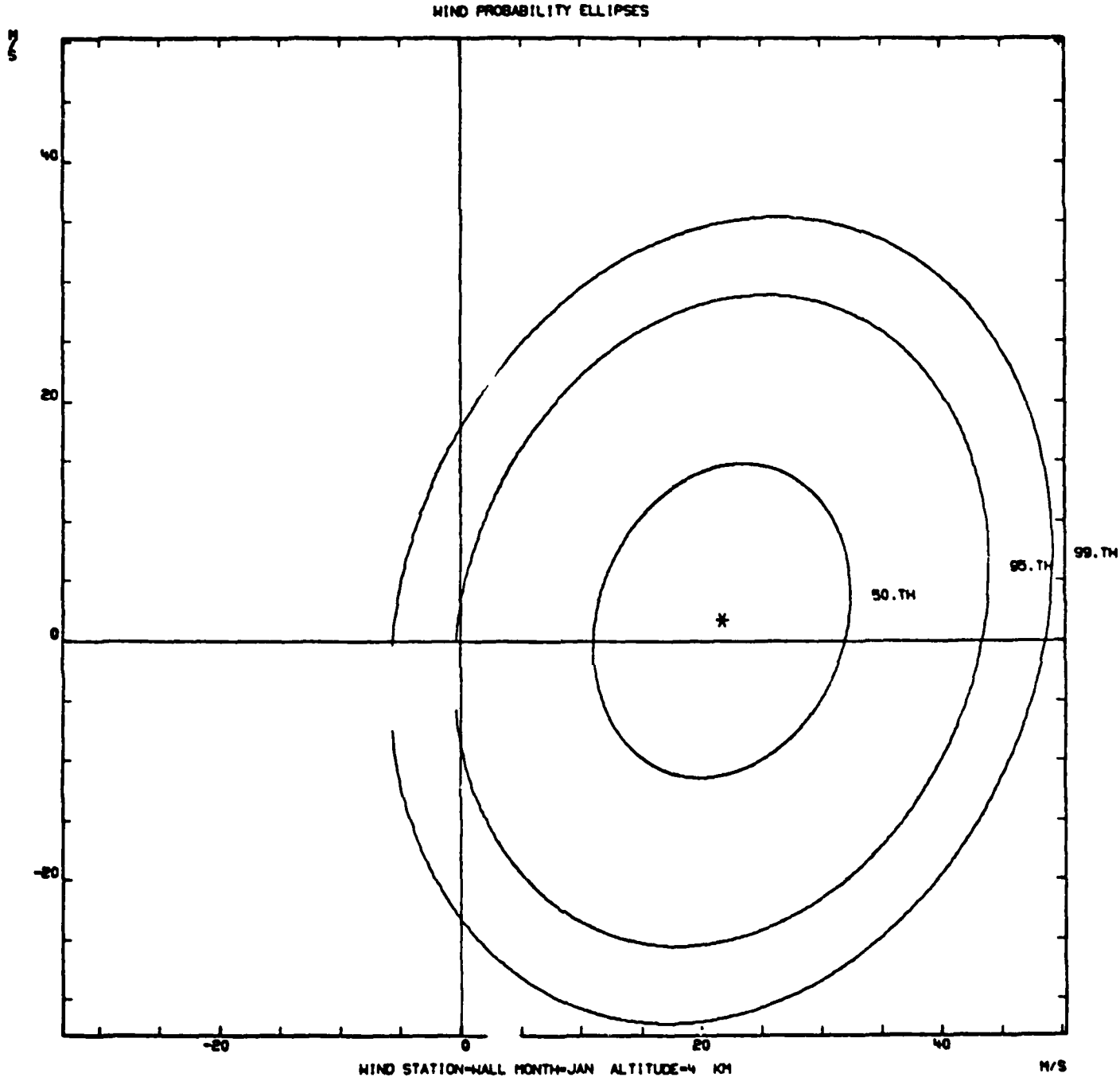

WIND PROBABILITY ELLIPSES
M/S
40
20
0
-20
-20
0
20
40
50.TH
95.TH
99.TH
WIND STATION=HALL MONTH=JAN ALTITUDE=4 KM
M/S

Figure A-33.

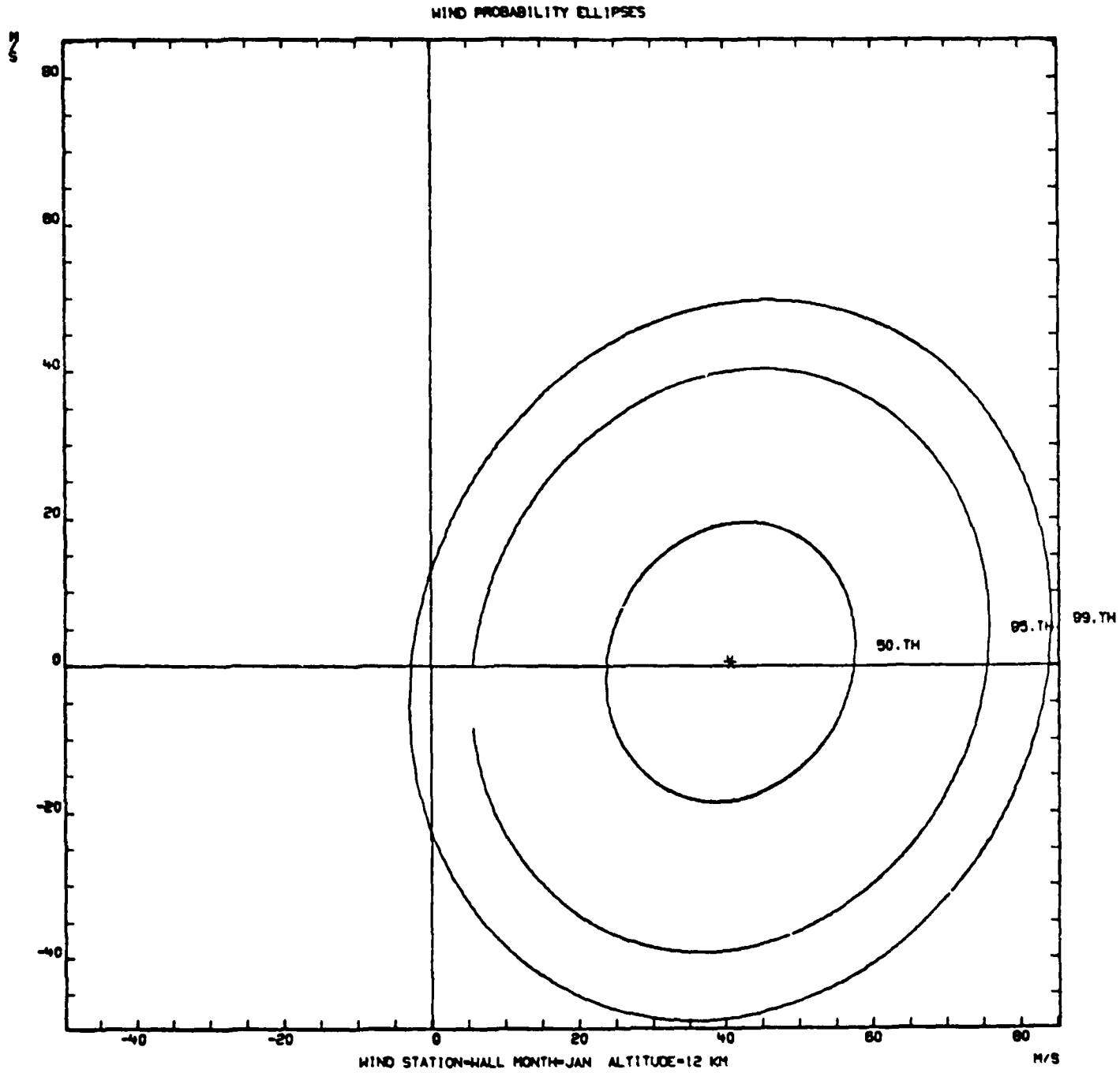

WIND PROBABILITY ELLIPSES
M/S
80
60
40
20
0
-20
-40
-40
-20
0
20
40
60
80
50.TH
95.TH
99.TH
WIND STATION=WALL MONTH=JAN ALTITUDE=12 KM
M/S

Figure A-34.

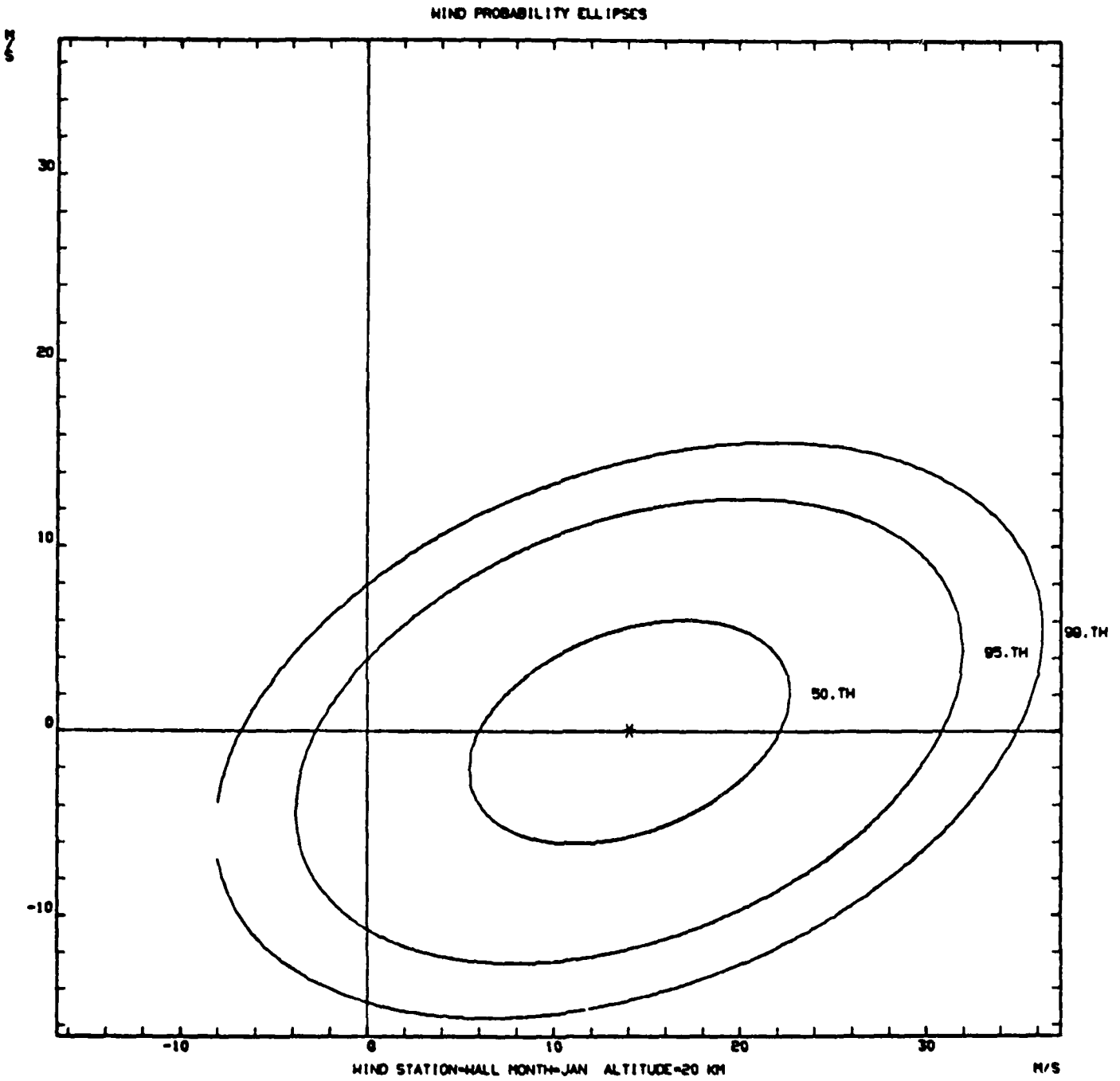

WIND PROBABILITY ELLIPSES
M/S
30
20
10
0
-10
-10
0
10
20
30
99.TH
95.TH
50.TH
WIND STATION=HALL MONTH=JAN ALTITUDE=20 KM
M/S

Figure A-35.

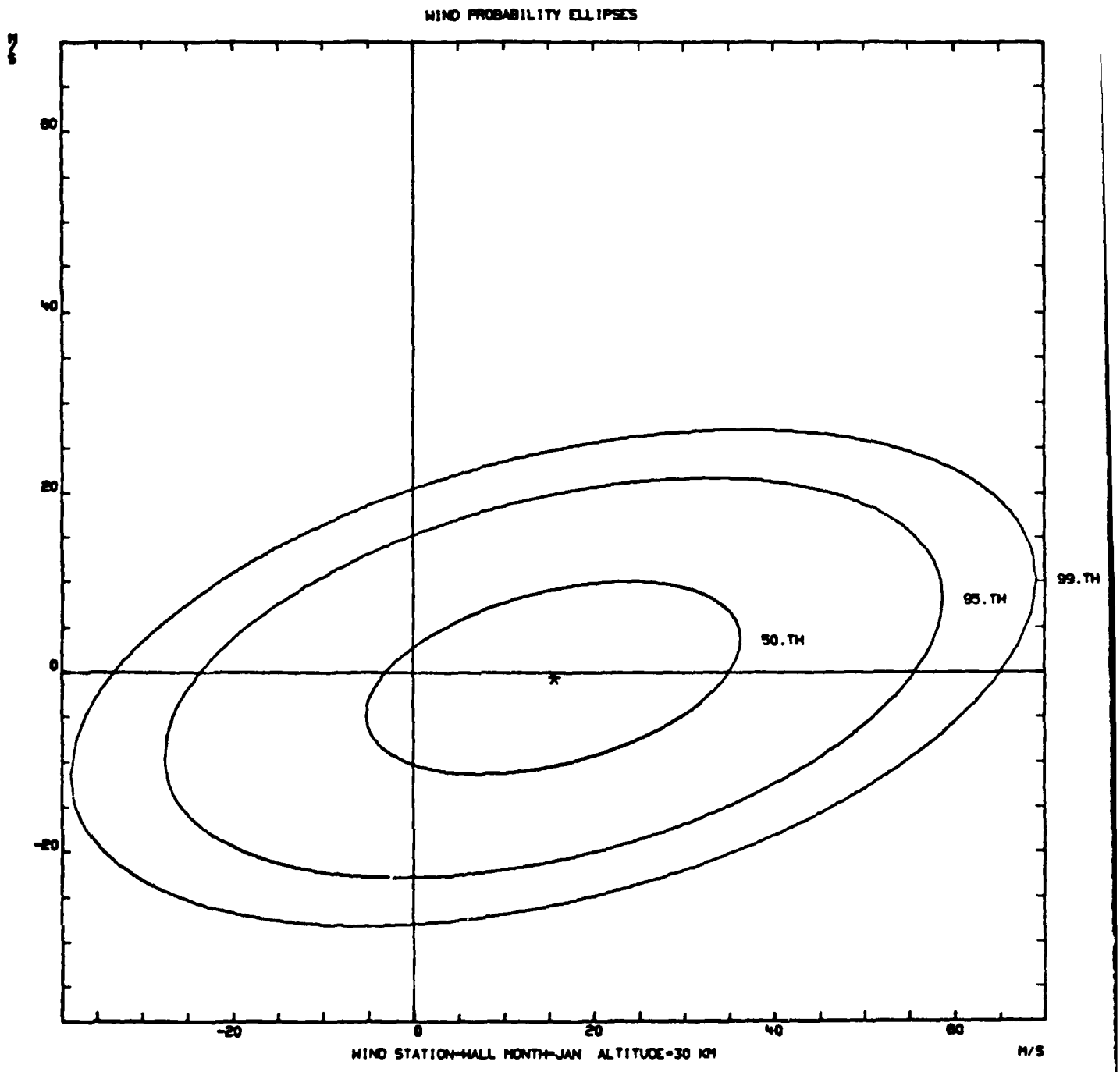

WIND PROBABILITY ELLIPSES
M/S
60
40
20
0
-20
-20
0
20
40
60
50.TH
95.TH
99.TH
WIND STATION=HALL MONTH=JAN ALTITUDE=30 KM
M/S

Figure A-36.

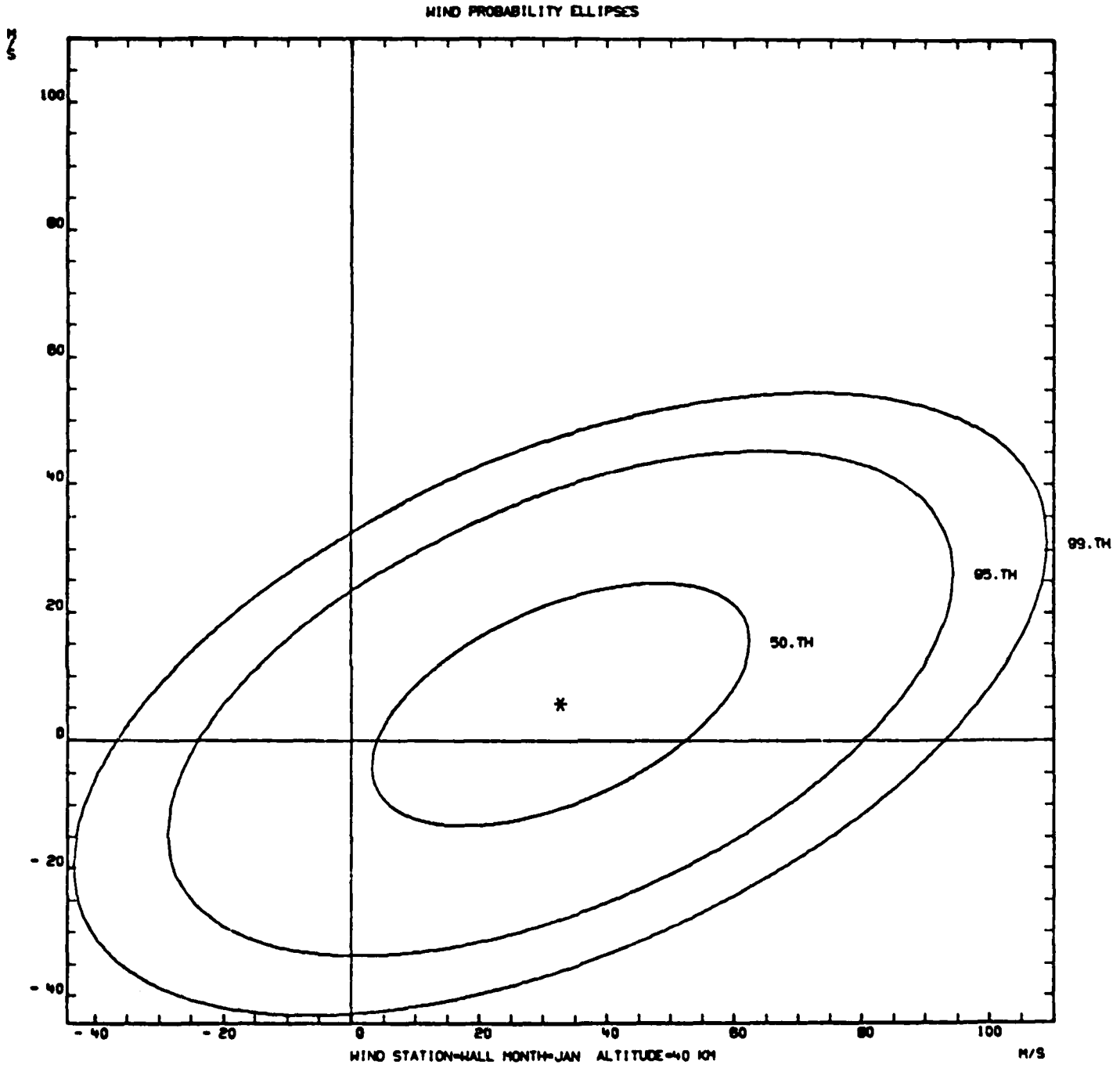

WIND PROBABILITY ELLIPSES
M/S
100
80
60
40
20
0
- 20
- 40
- 40
- 20
0
20
40
60
80
100
99.TH
95.TH
50.TH
WIND STATION=HALL MONTH=JAN ALTITUDE=40 KM
M/S

Figure A-37.

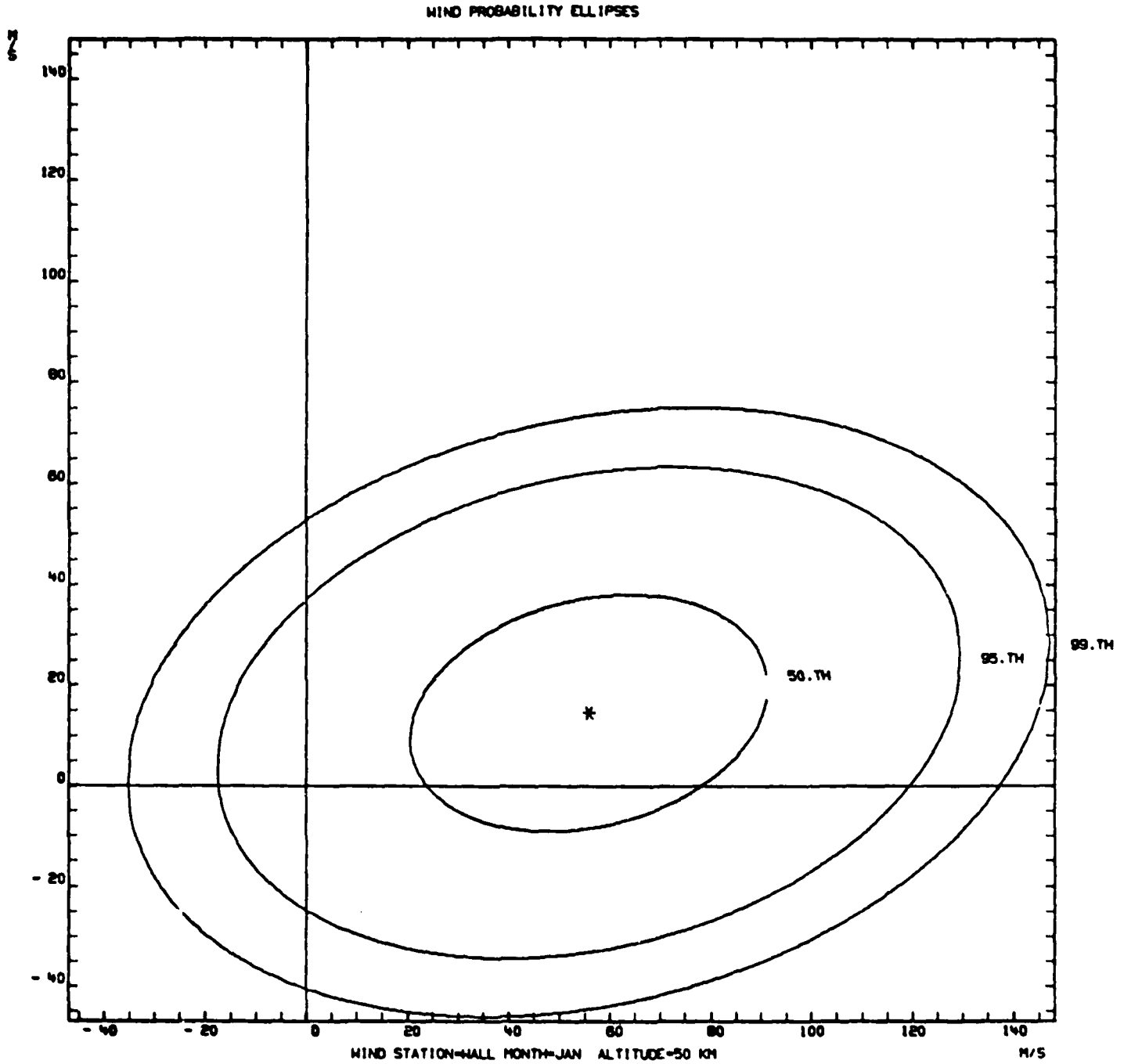

WIND PROBABILITY ELLIPSES
N
S
140
120
100
80
60
40
20
0
- 20
- 40
- 40
- 20
0
20
40
60
80
100
120
140
50.TH
95.TH
99.TH
WIND STATION=HALL MONTH=JAN ALTITUDE=50 KM
M/S

Figure A-38.

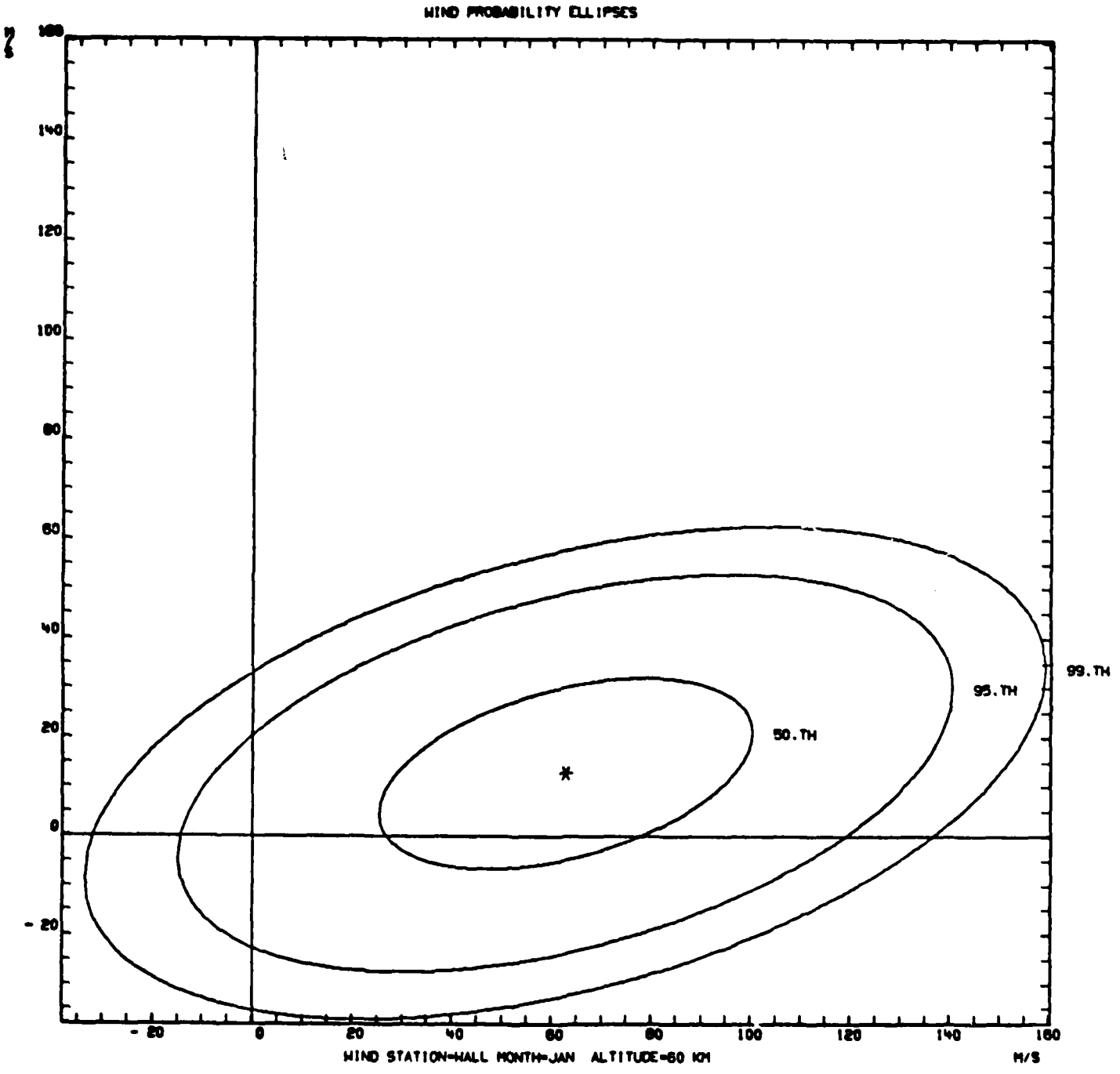

WIND PROBABILITY ELLIPSES
M/S
160
140
120
100
80
60
40
20
0
- 20
99.TH
95.TH
50.TH
- 20
0
20
40
60
80
100
120
140
160
WIND STATION=WALL MONTH=JAN ALTITUDE=60 KM
M/S

Figure A-39.

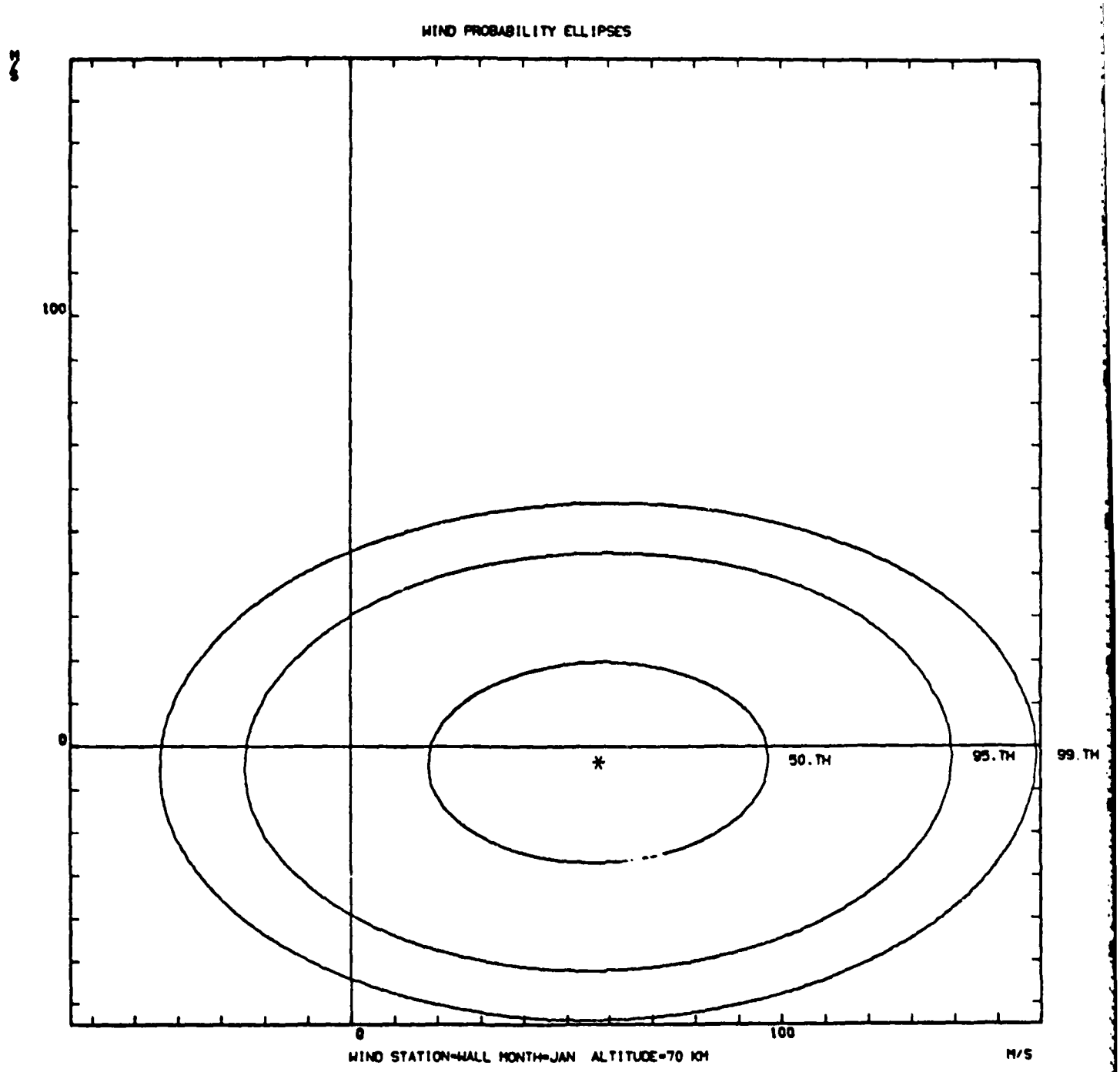

WIND PROBABILITY ELLIPSES
N
100
0
50.TH
95.TH
99.TH
0
100
WIND STATION=HALL MONTH=JAN ALTITUDE=70 KM
M/S

Figure A-40.

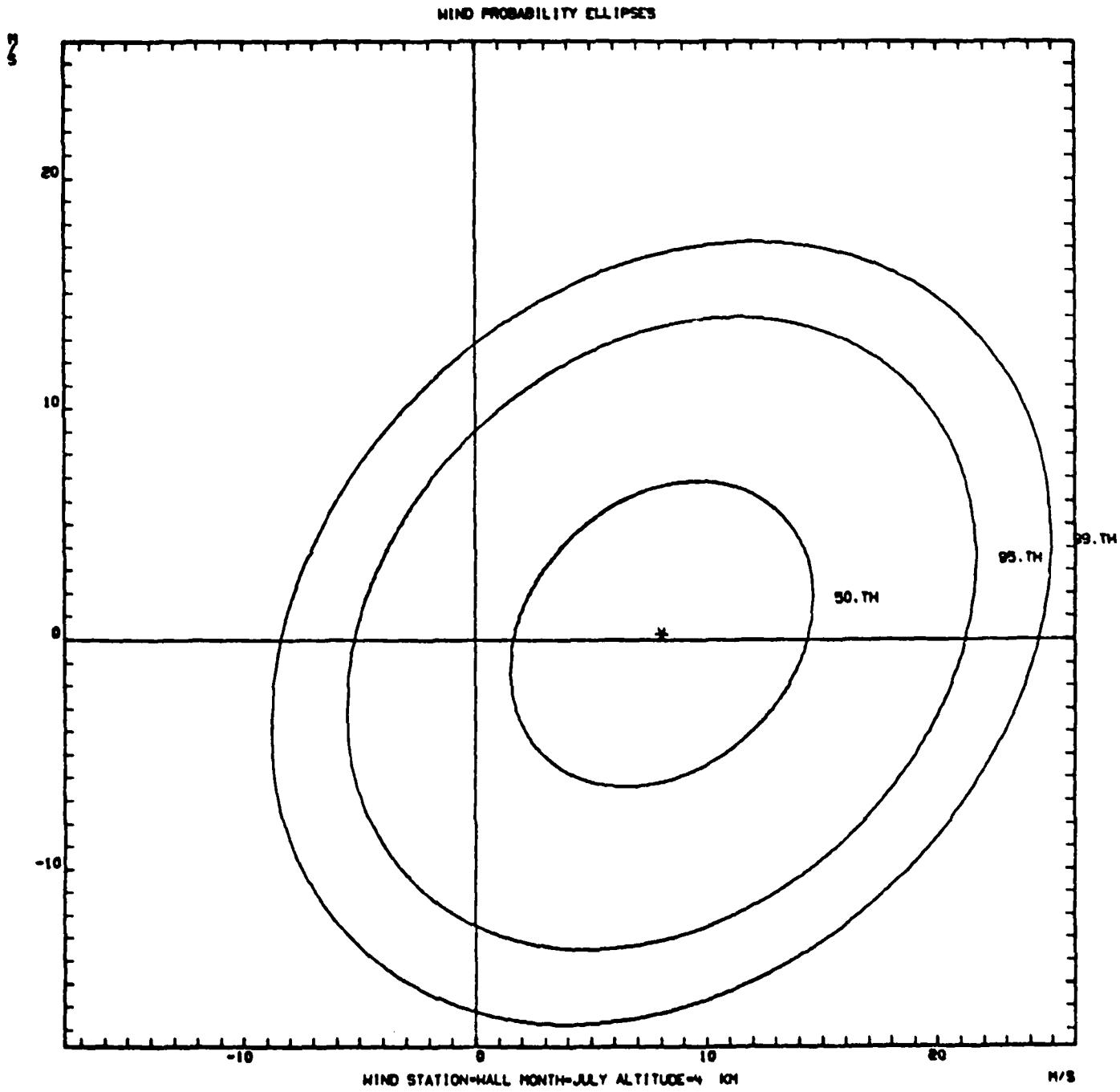

WIND PROBABILITY ELLIPSES
N
S
20
10
0
-10
99.TH
95.TH
50.TH
-10
0
10
20
WIND STATION=HALL MONTH=JULY ALTITUDE=4 KM
M/S

Figure A-41.

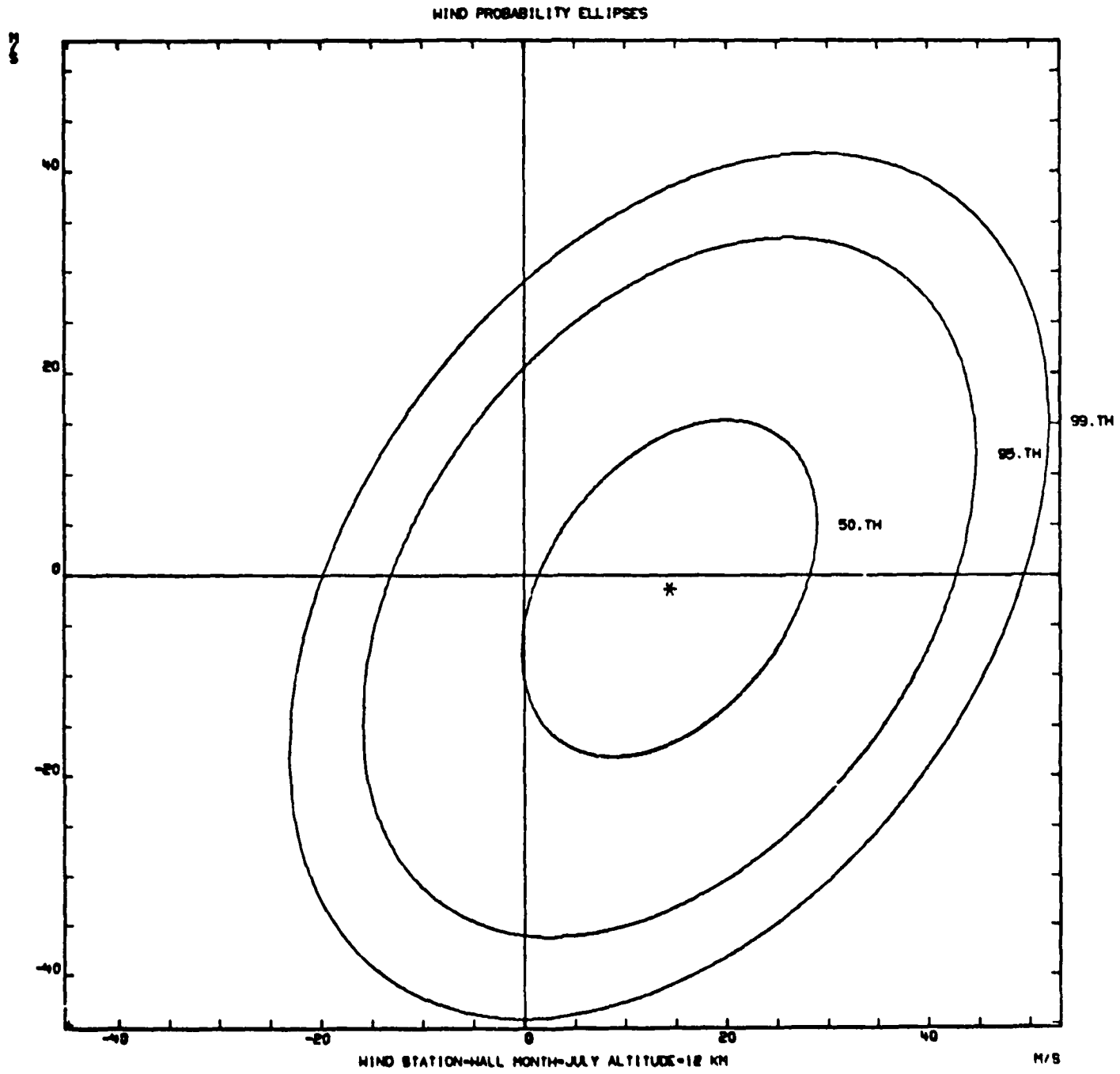

WIND PROBABILITY ELLIPSES
M/S
40
20
0
-20
-40
-40
-20
0
20
40
99.TH
95.TH
50.TH
WIND STATION=HALL MONTH=JULY ALTITUDE=12 KM
M/S

Figure A-42.

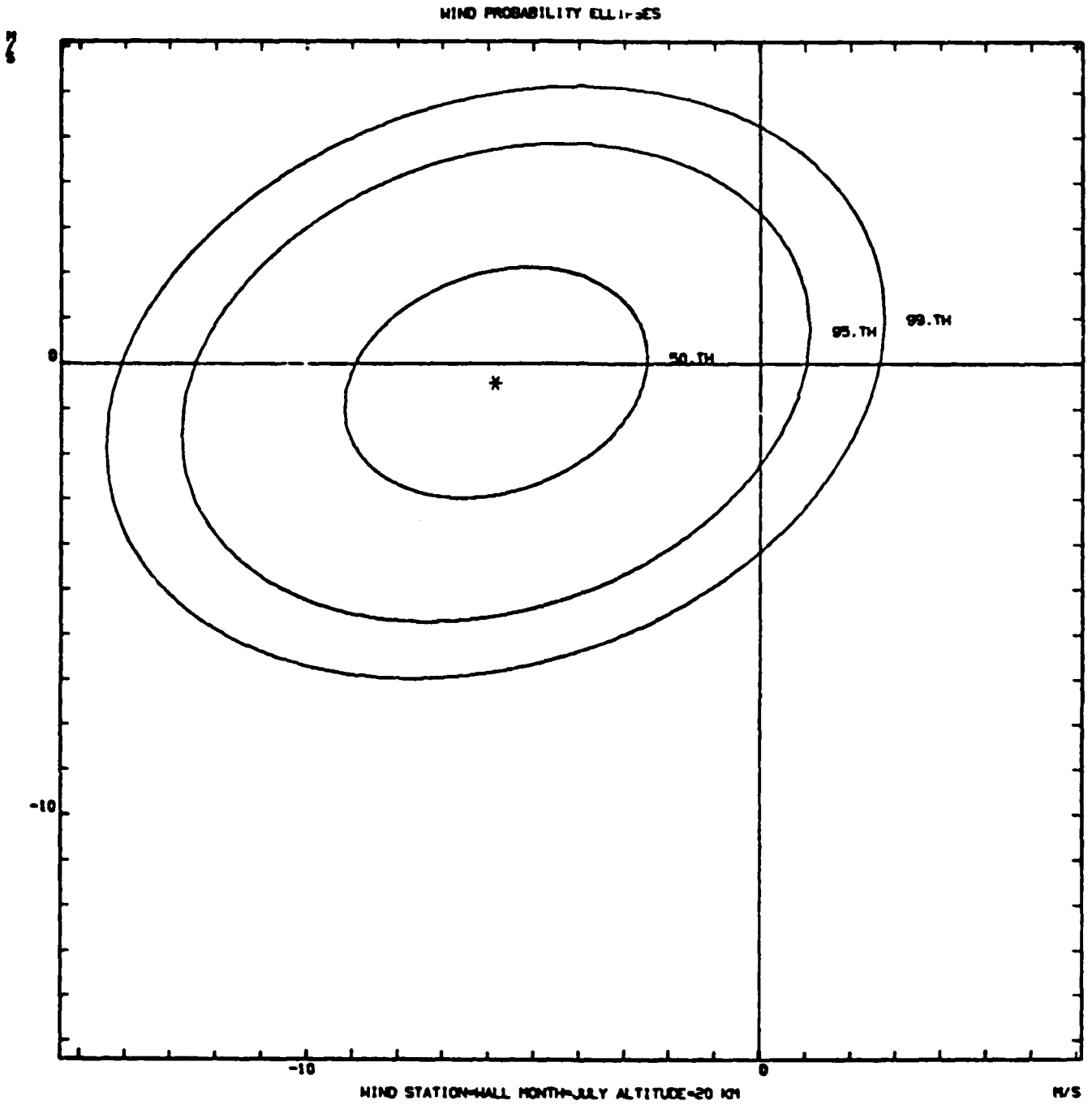

WIND PROBABILITY ELLIPSES
95.TH
99.TH
50.TH
0
-10
-10
0
WIND STATION=HALL MONTH=JULY ALTITUDE=20 KM
M/S

Figure A-43.

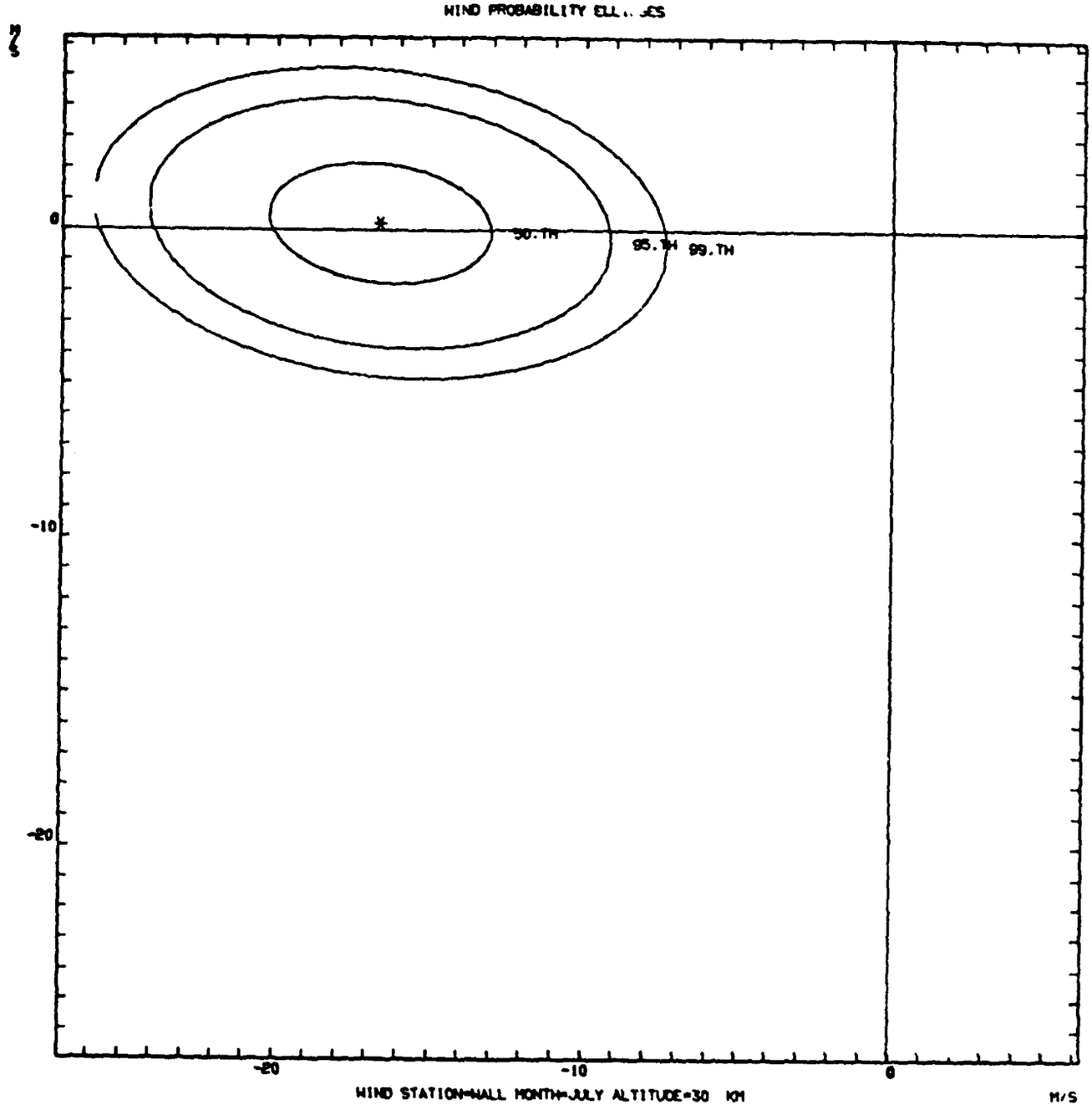

WIND PROBABILITY ELL.. ..ES
M/S
0
-10
-20
50.TH
95.TH
99.TH
-20
-10
0
WIND STATION=HALL MONTH=JULY ALTITUDE=30 KM
M/S

Figure A-44.

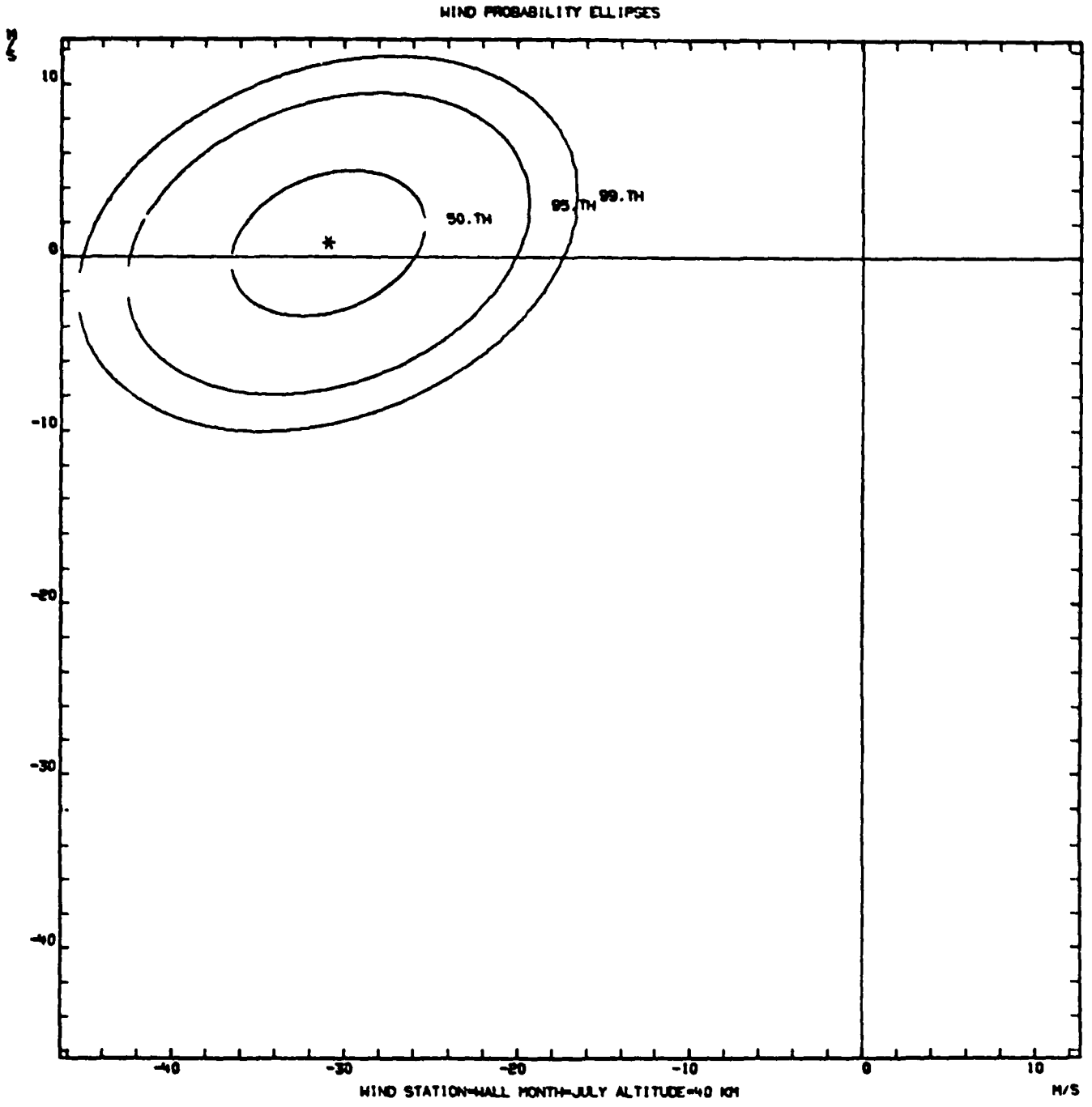

WIND PROBABILITY ELLIPSES
M/S
10
0
-10
-20
-30
-40
50.TH
95.TH
99.TH
-40
-30
-20
-10
0
10
WIND STATION=HALL MONTH=JULY ALTITUDE=40 KM
M/S

Figure A-45.

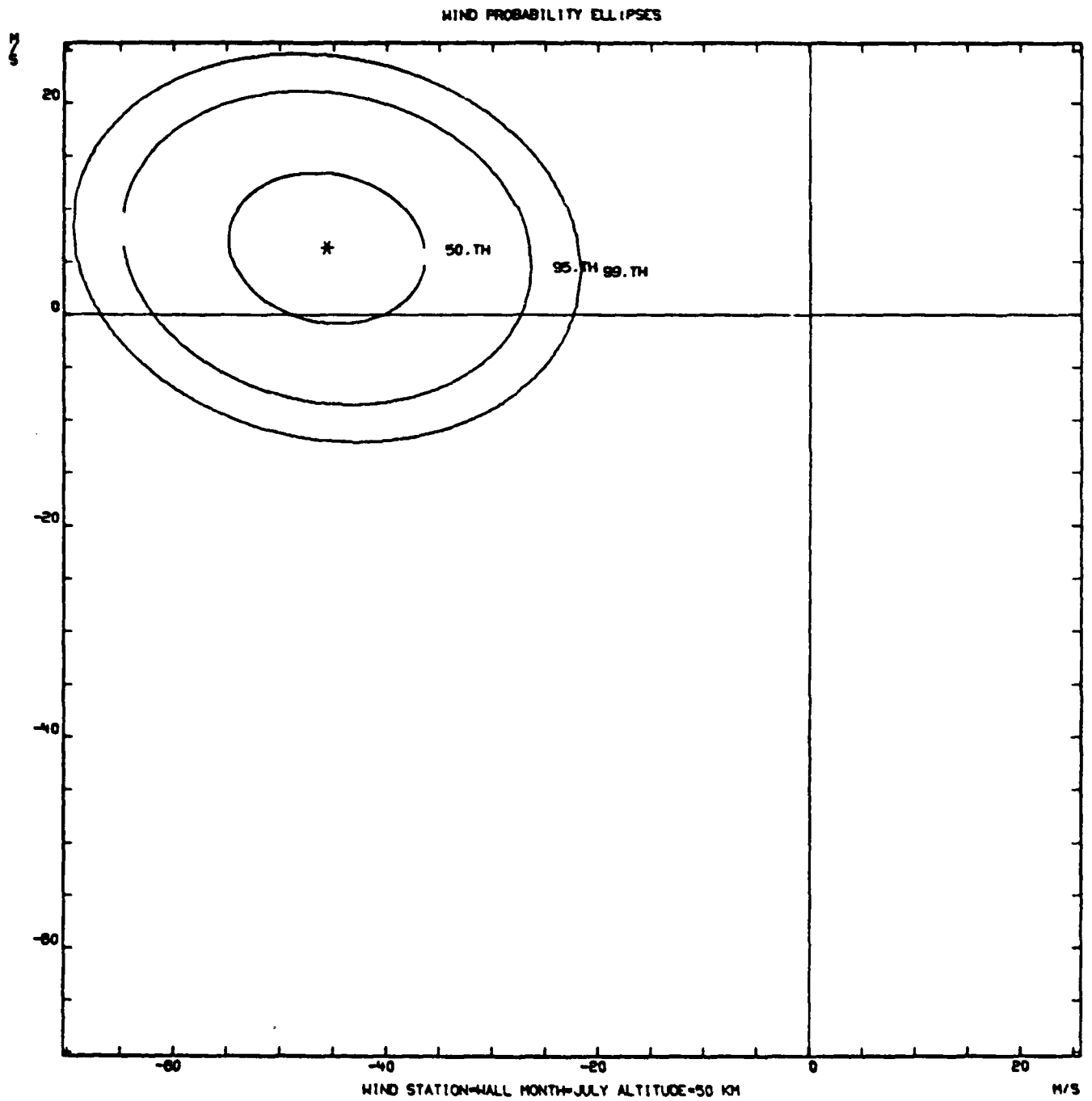

WIND PROBABILITY ELLIPSES
M/S
20
0
-20
-40
-60
50.TH
95.TH
99.TH
-60
-40
-20
0
20
WIND STATION=HALL MONTH=JULY ALTITUDE=50 KM
M/S

Figure A-46.

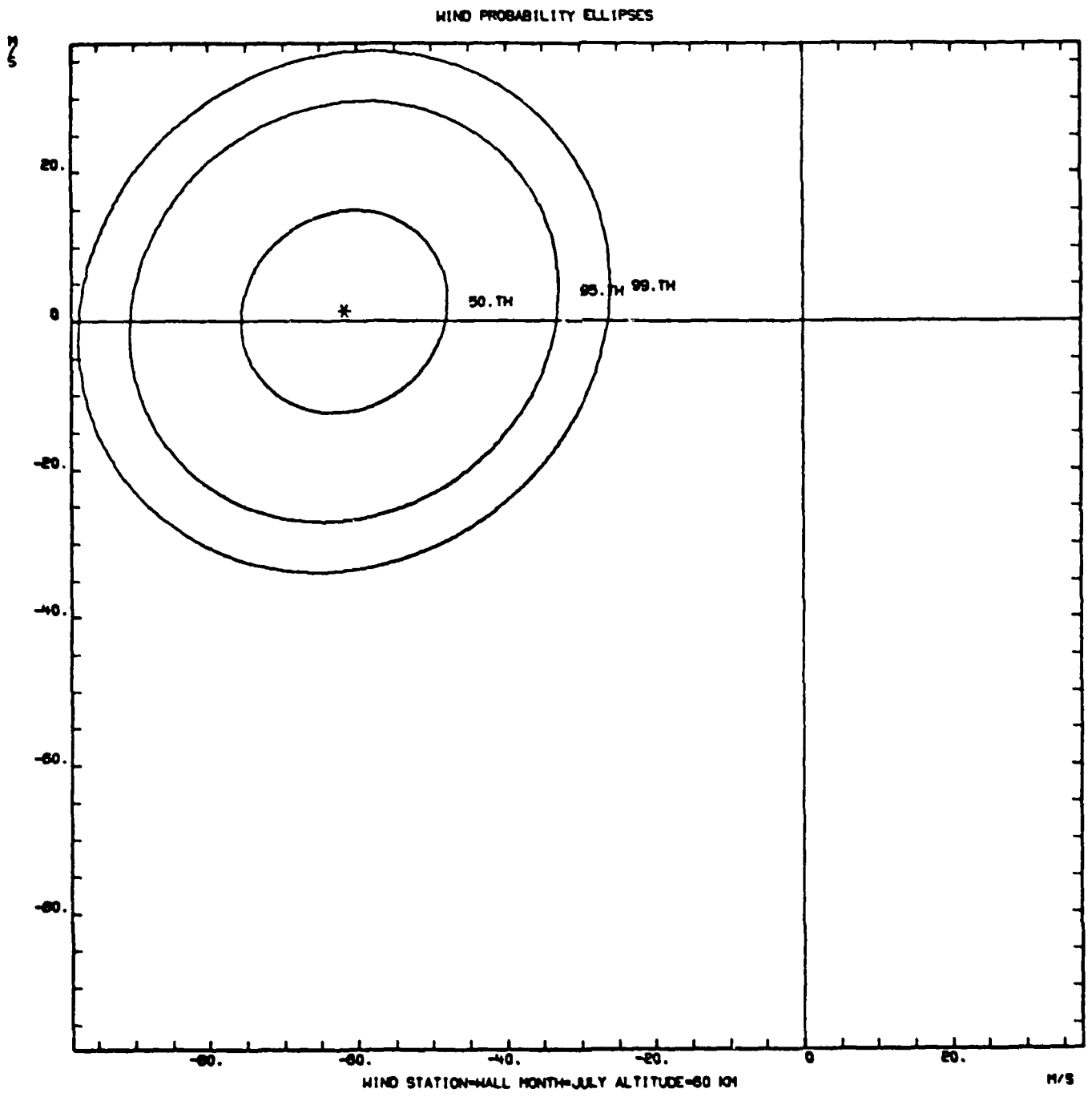

WIND PROBABILITY ELLIPSES
N
S
20.
0
-20.
-40.
-60.
-80.
50.TH
95.TH
99.TH
-80.
-60.
-40.
-20.
0
20.
M/S
WIND STATION=HALL MONTH=JULY ALTITUDE=60 KM

Figure A-47.

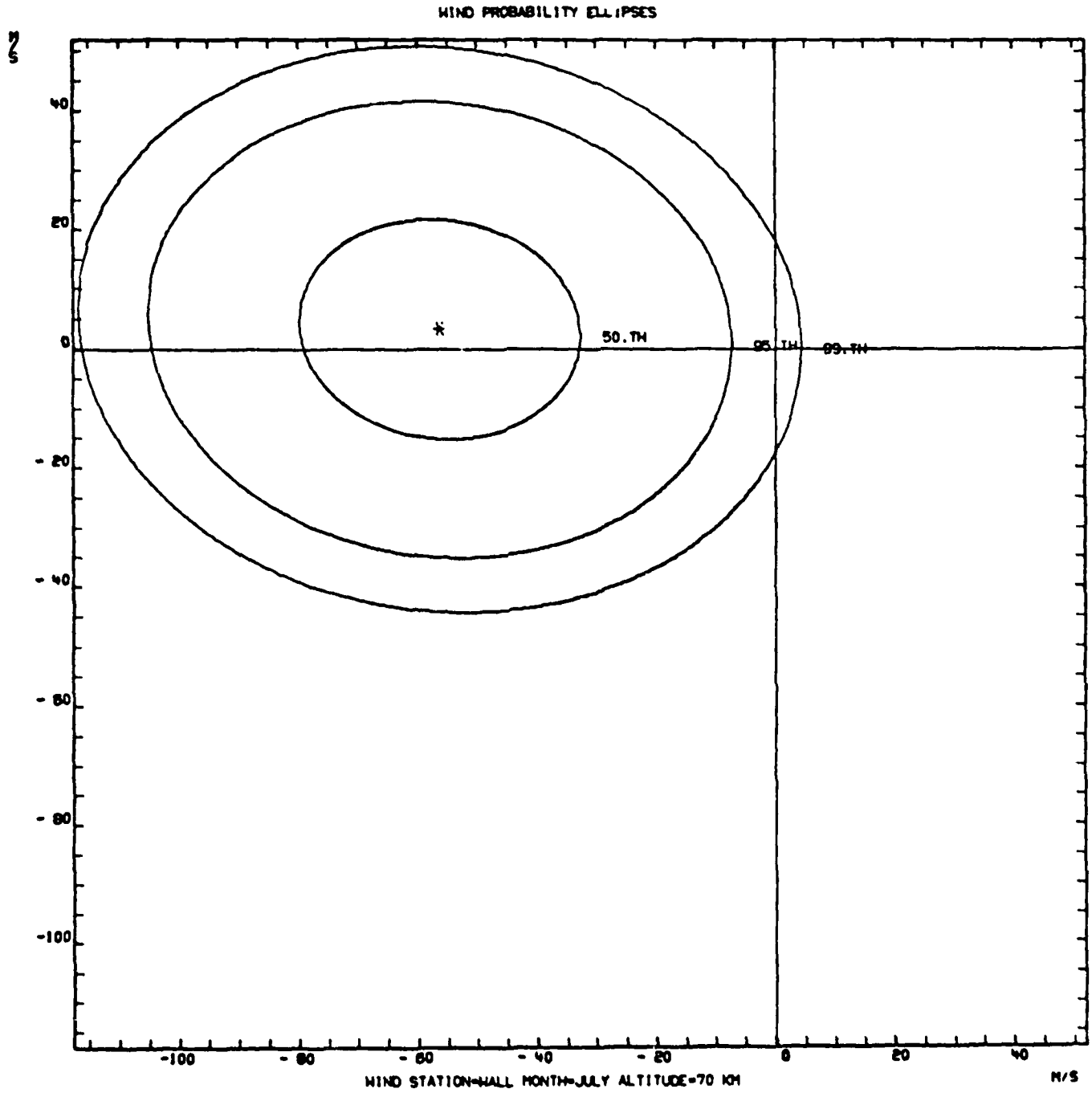

WIND PROBABILITY ELLIPSES
M/S
40
20
0
-20
-40
-60
-80
-100
50.TH
95.TH
99.TH
-100
-80
-60
-40
-20
0
20
40
M/S
WIND STATION=HALL MONTH=JULY ALTITUDE=70 KM

Figure A-48.

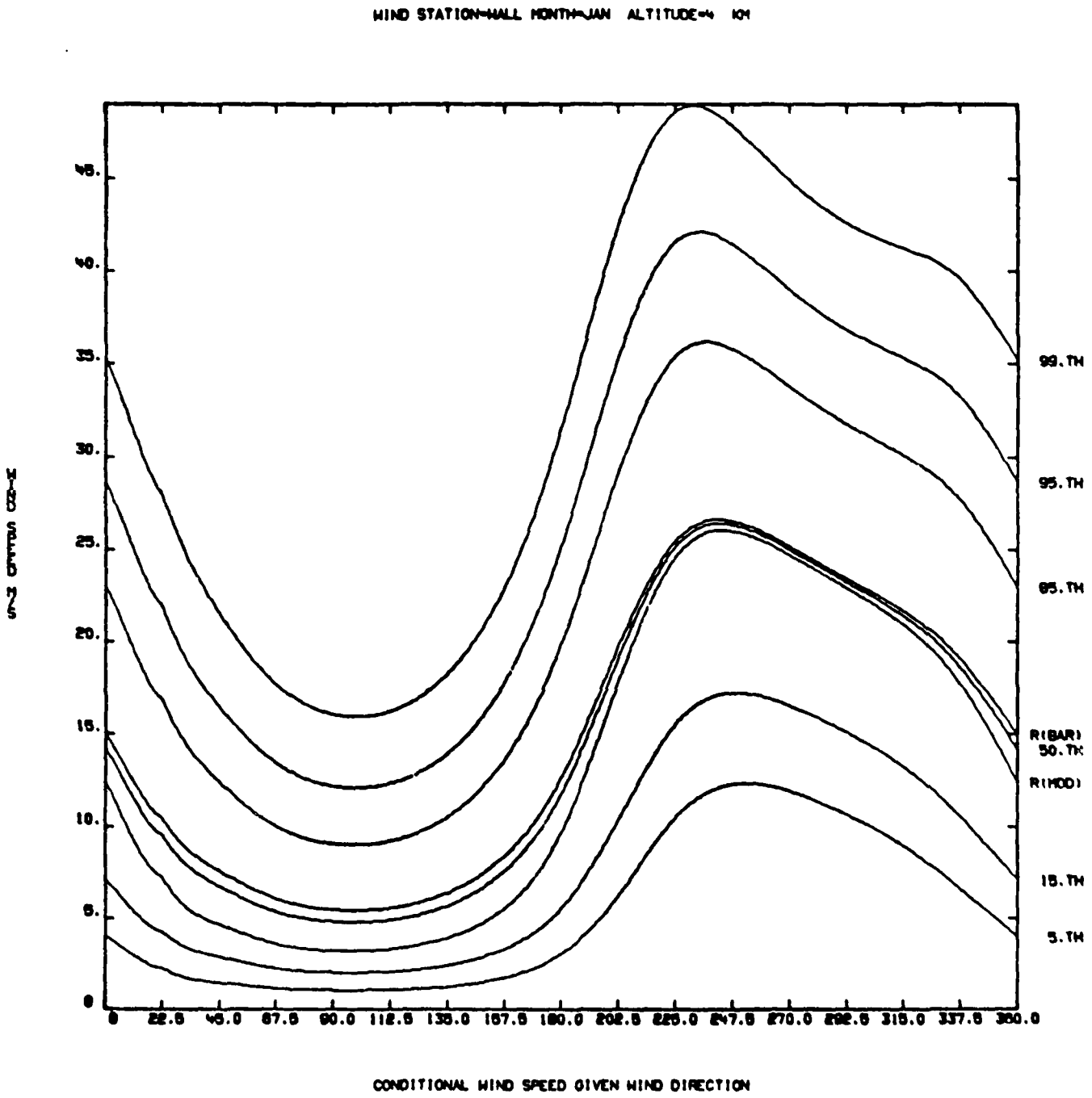

WIND STATION=WALL MONTH=JAN ALTITUDE=4 KM
WIND SPEED M/S
0
5.
10.
15.
20.
25.
30.
35.
40.
45.
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-49.

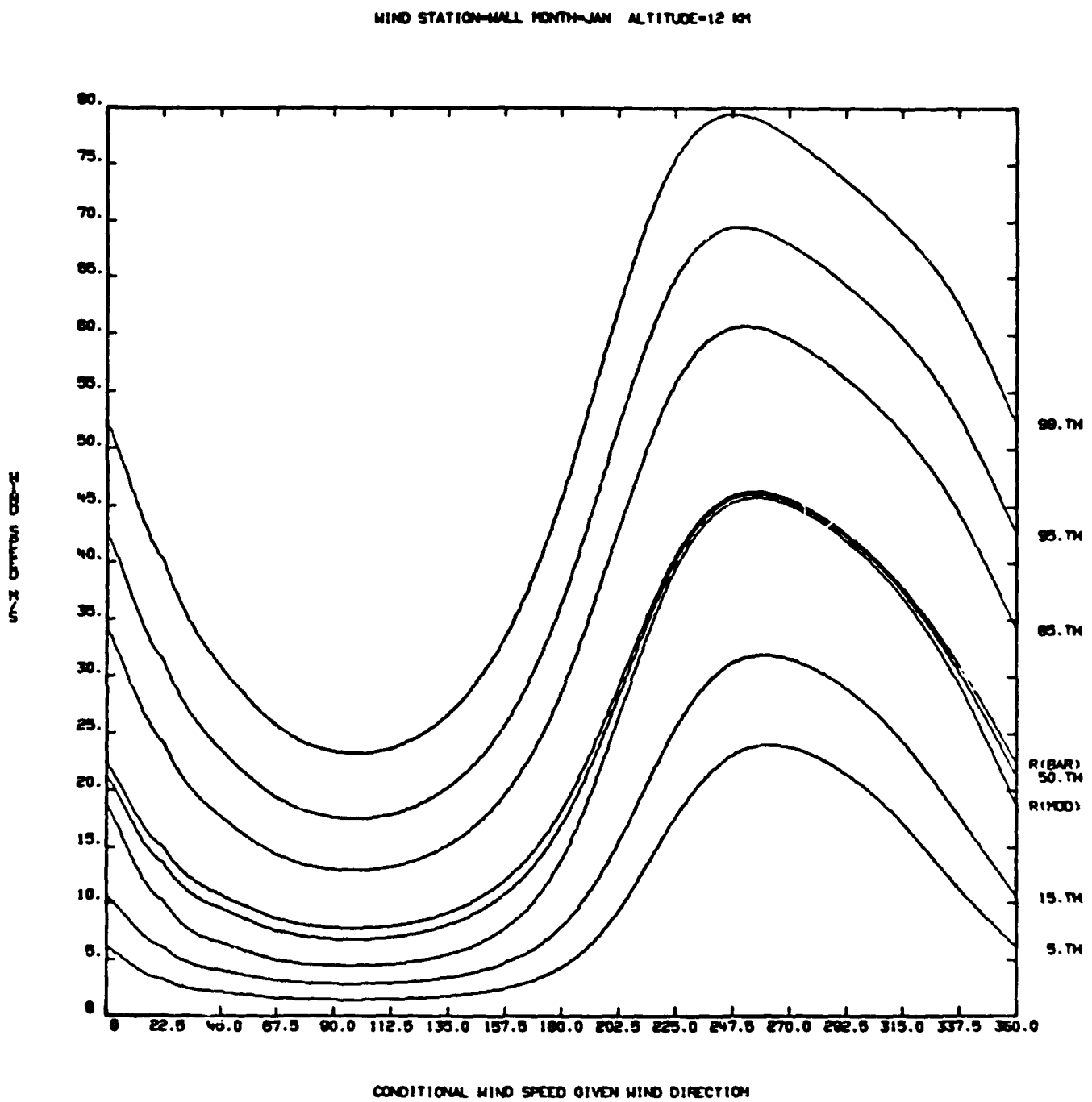

WIND STATION=WALL MONTH=JAN ALTITUDE=12 KM
80.
75.
70.
65.
60.
55.
50.
45.
40.
35.
30.
25.
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-50.

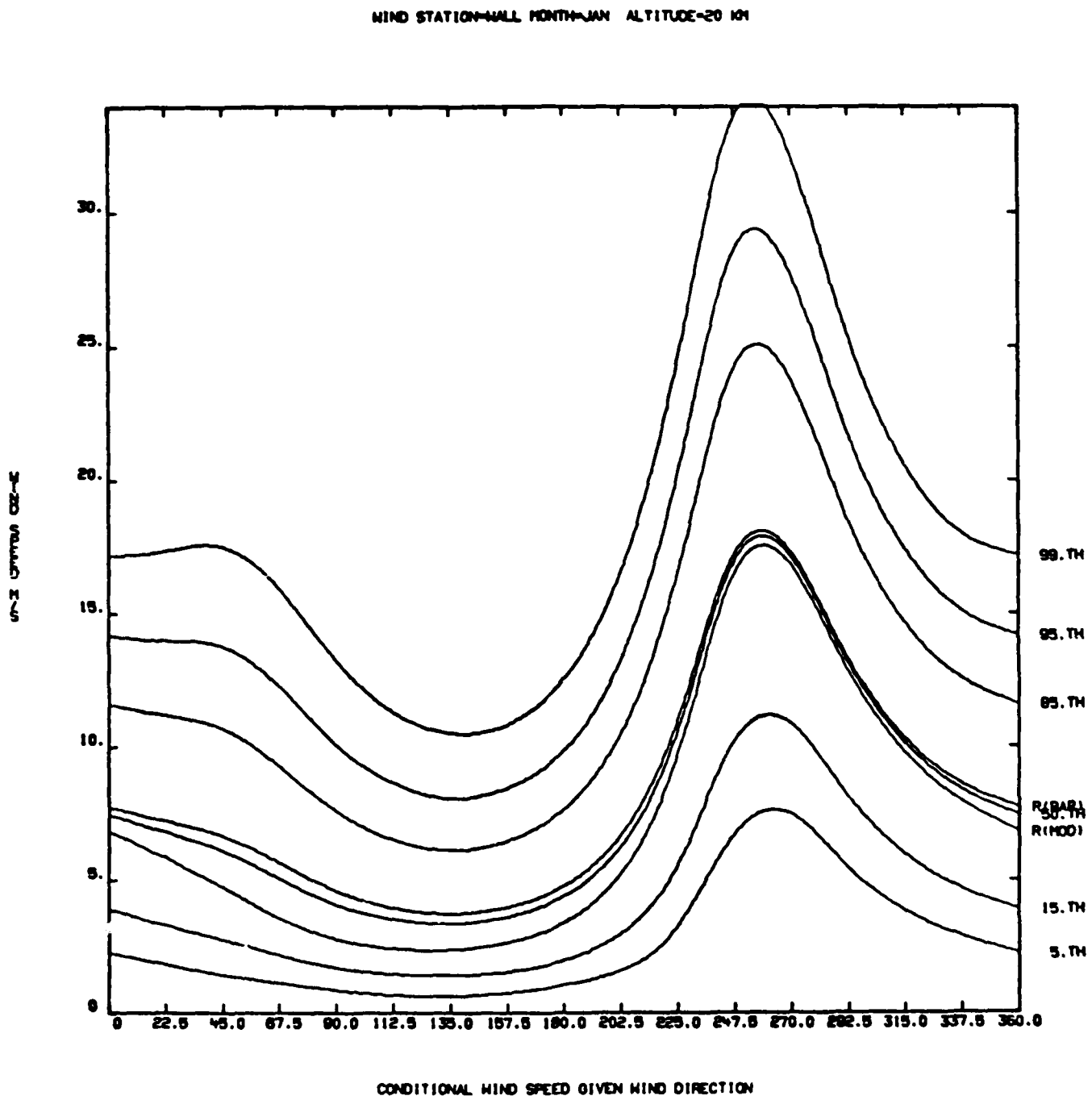

WIND STATION=WALL MONTH=JAN ALTITUDE=20 KM
WIND SPEED M/S
30.
25.
20.
15.
10.
5.
0
99.TH
95.TH
85.TH
50.TH
R(HOD)
15.TH
5.TH
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-51.

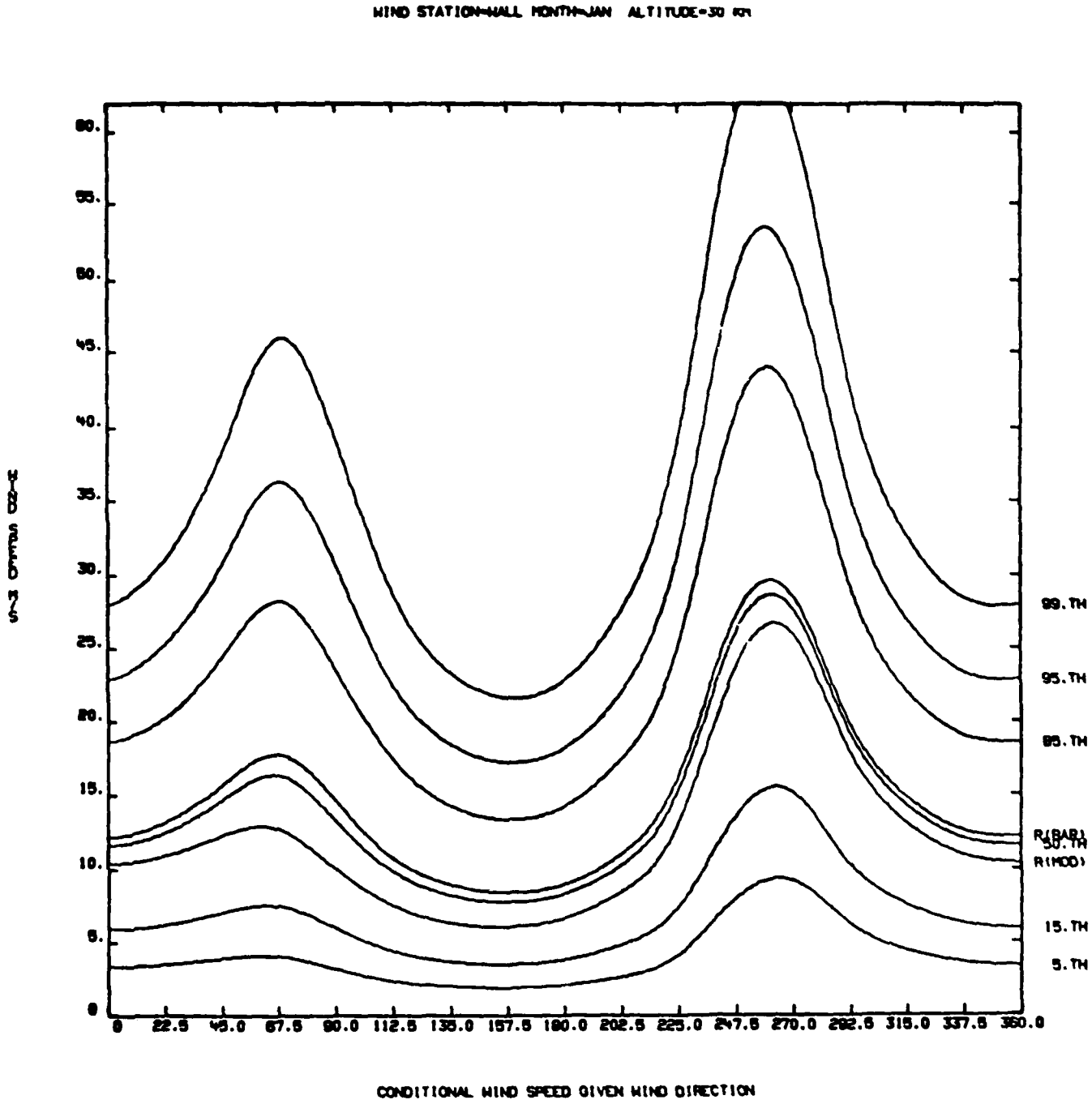

WIND STATION=HALL MONTH=JAN ALTITUDE=30
60.
55.
50.
45.
40.
35.
30.
25.
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
50.TH
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-52.

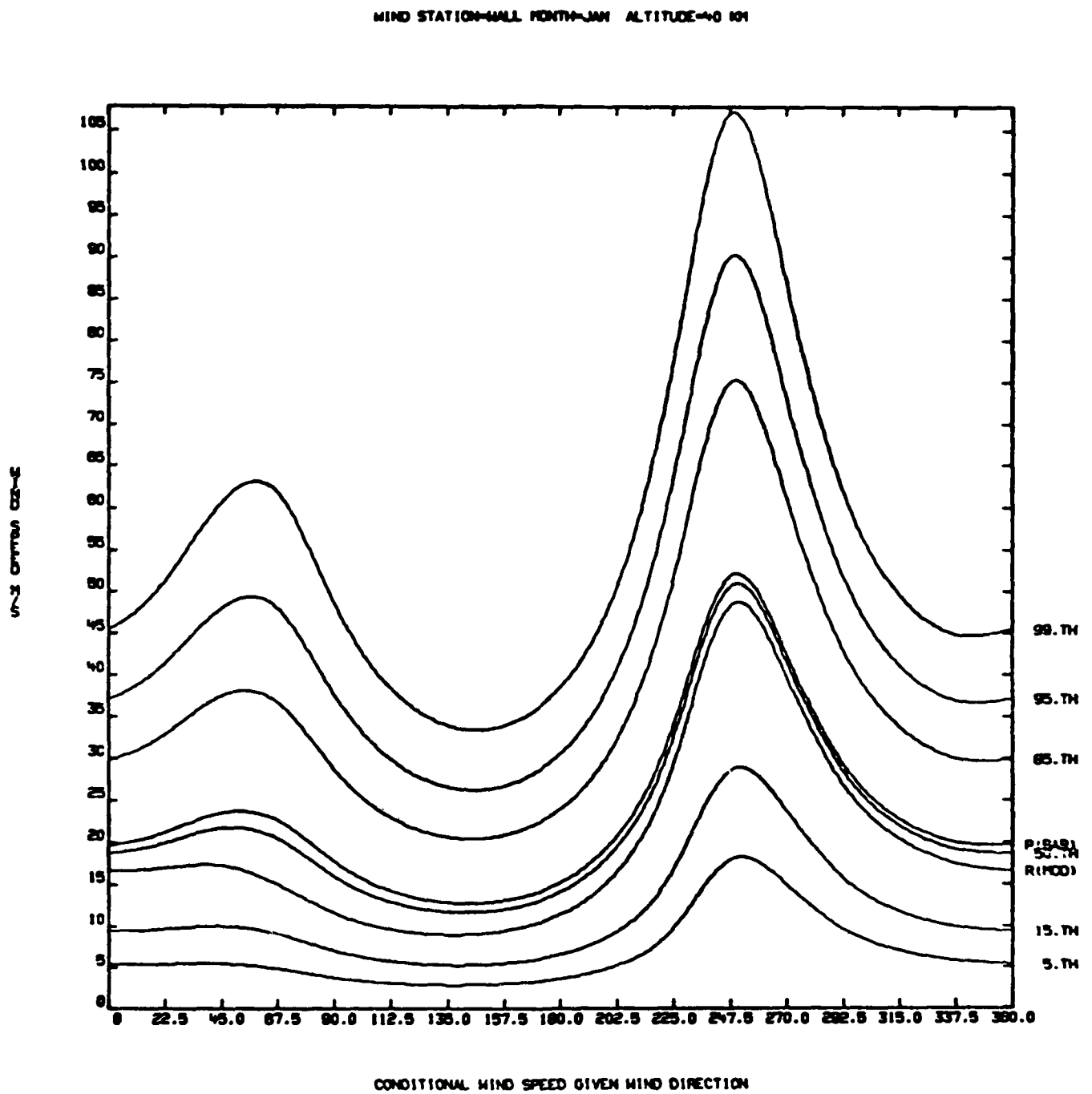

MIND STATION=HALL MONTH=JAN ALTITUDE=40 KM
99.TH
95.TH
85.TH
15.TH
5.TH
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
CONDITIONAL MIND SPEED GIVEN MIND DIRECTION

Figure A-53.

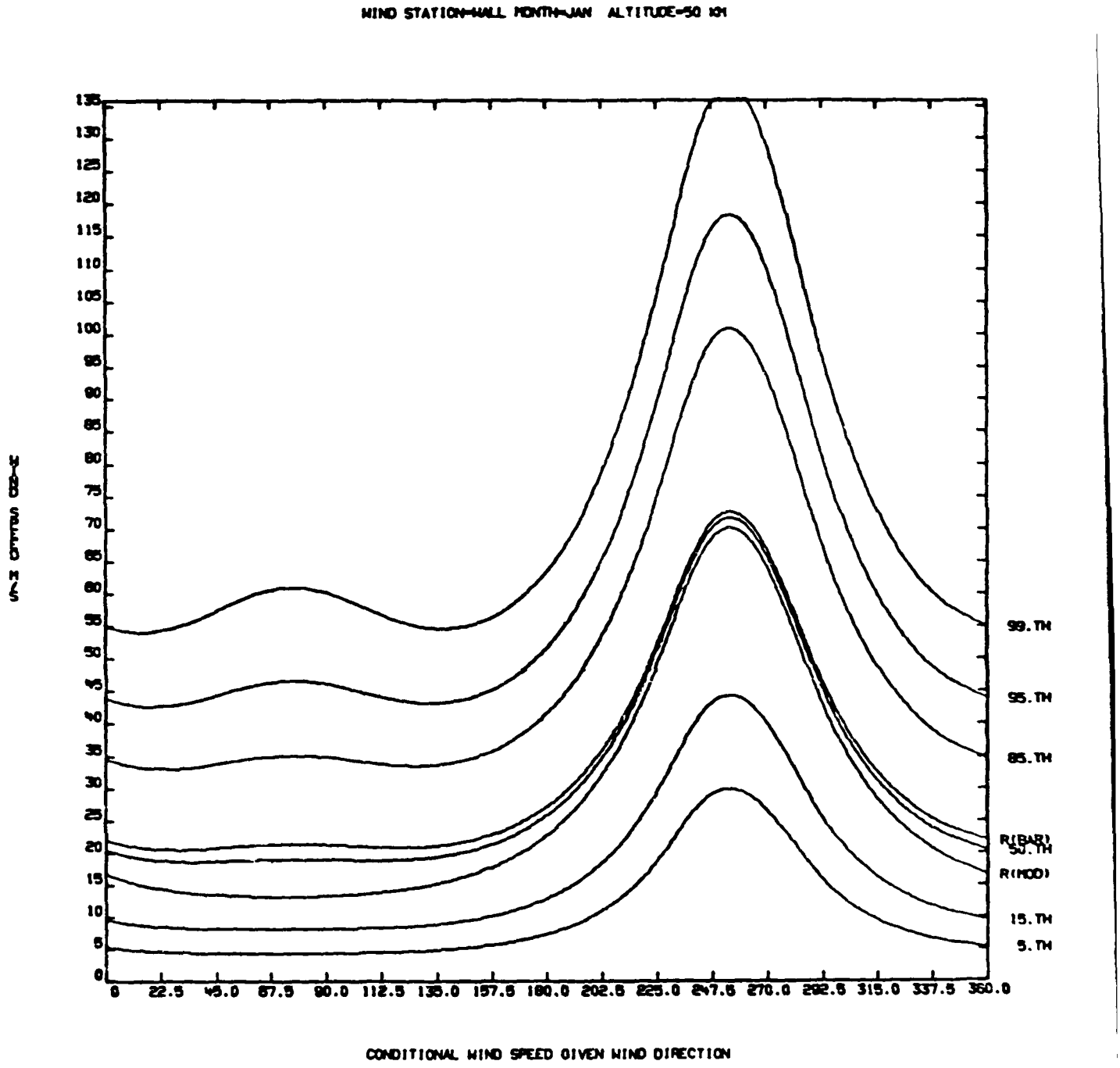

WIND STATION=HALL MONTH=JAN ALTITUDE=50 KM
WIND SPEED M/S
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-54.

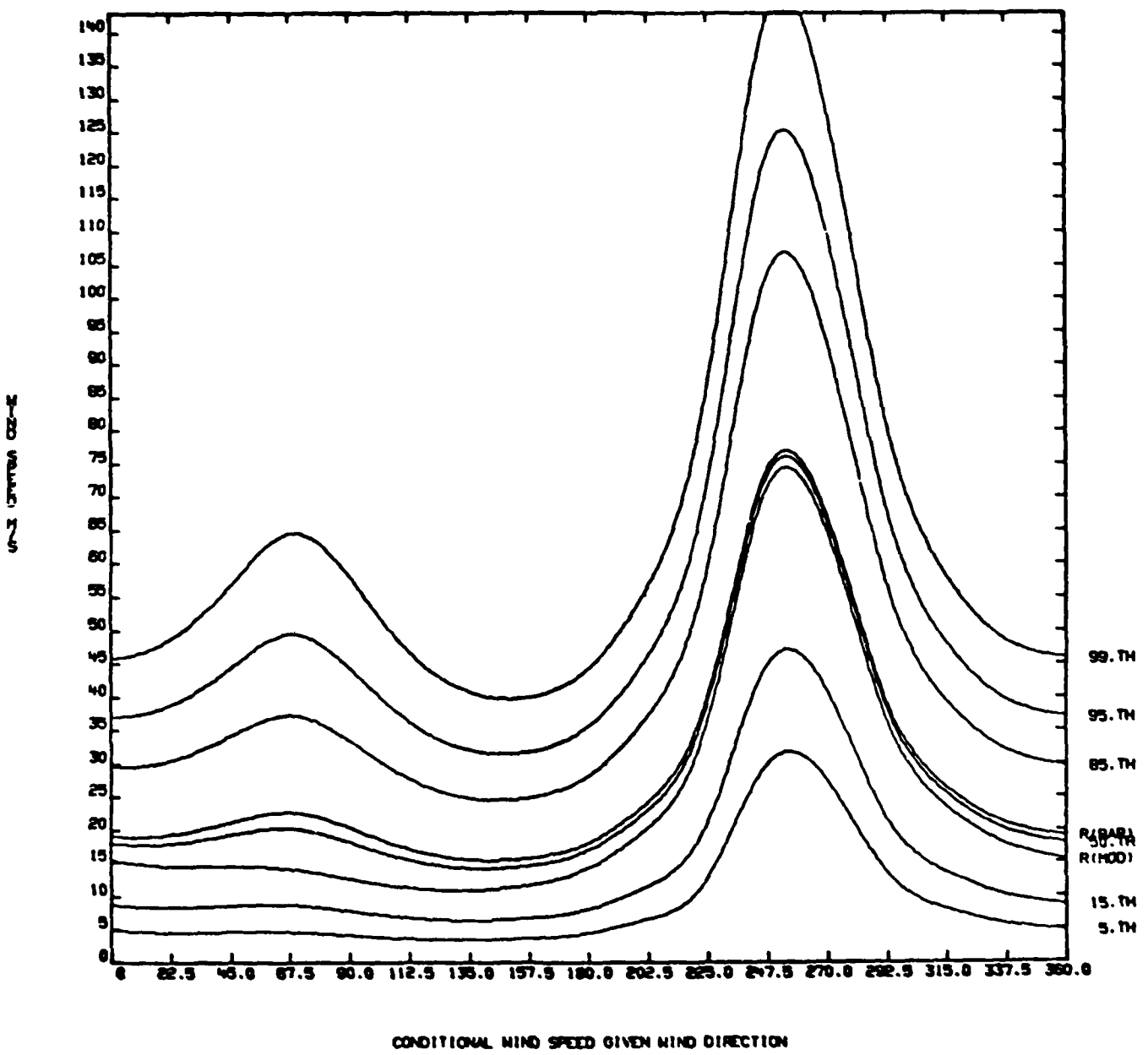

WIND STATION=HALL MONTH=JAN ALTITUDE=60 KM
WIND SPEED M/S
99.TH
95.TH
85.TH
50.TH
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-55.

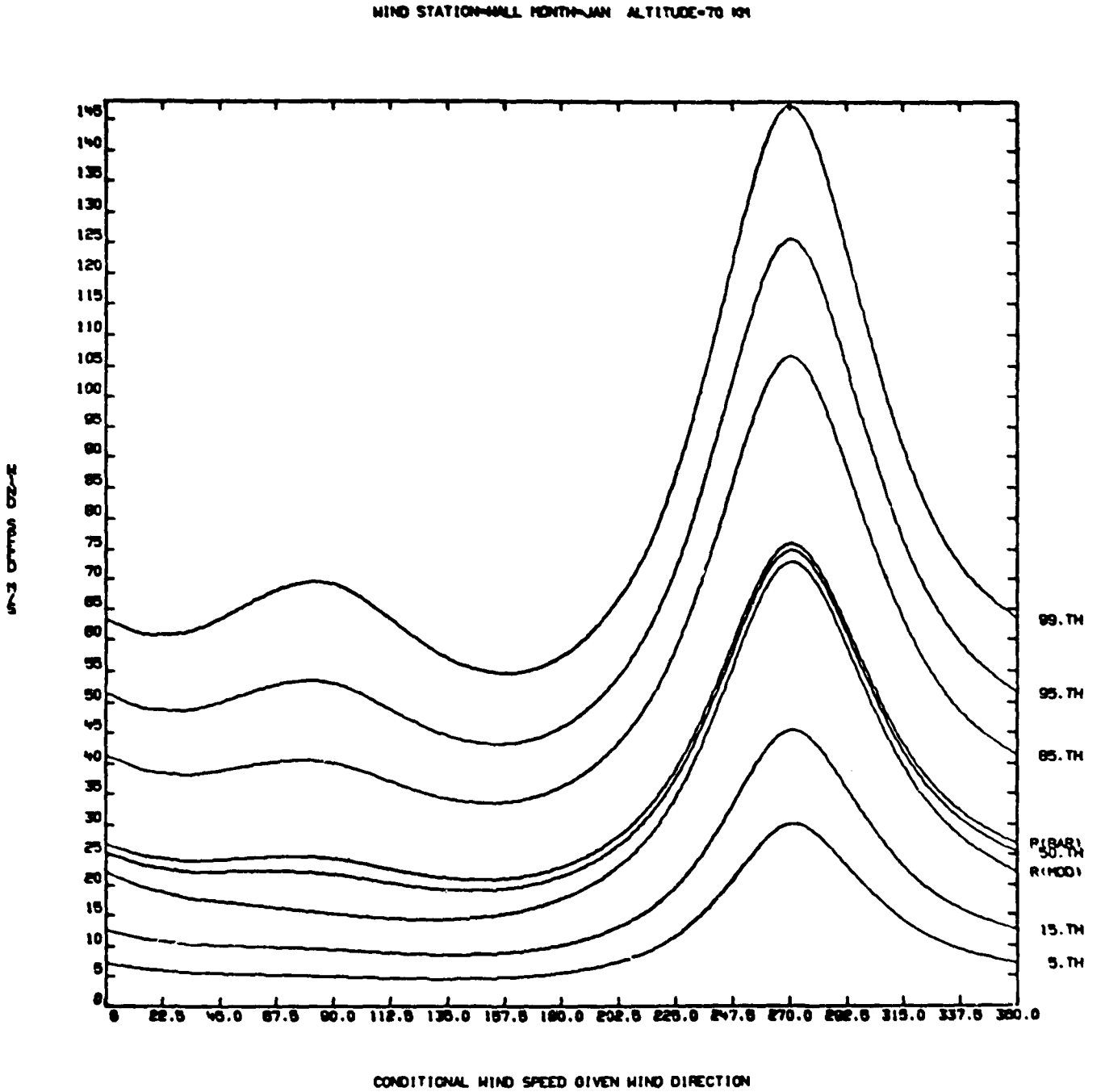

WIND STATION=WALL MONTH=JAN ALTITUDE=70 KM
99.TH
95.TH
85.TH
50.TH
15.TH
5.TH
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-56.

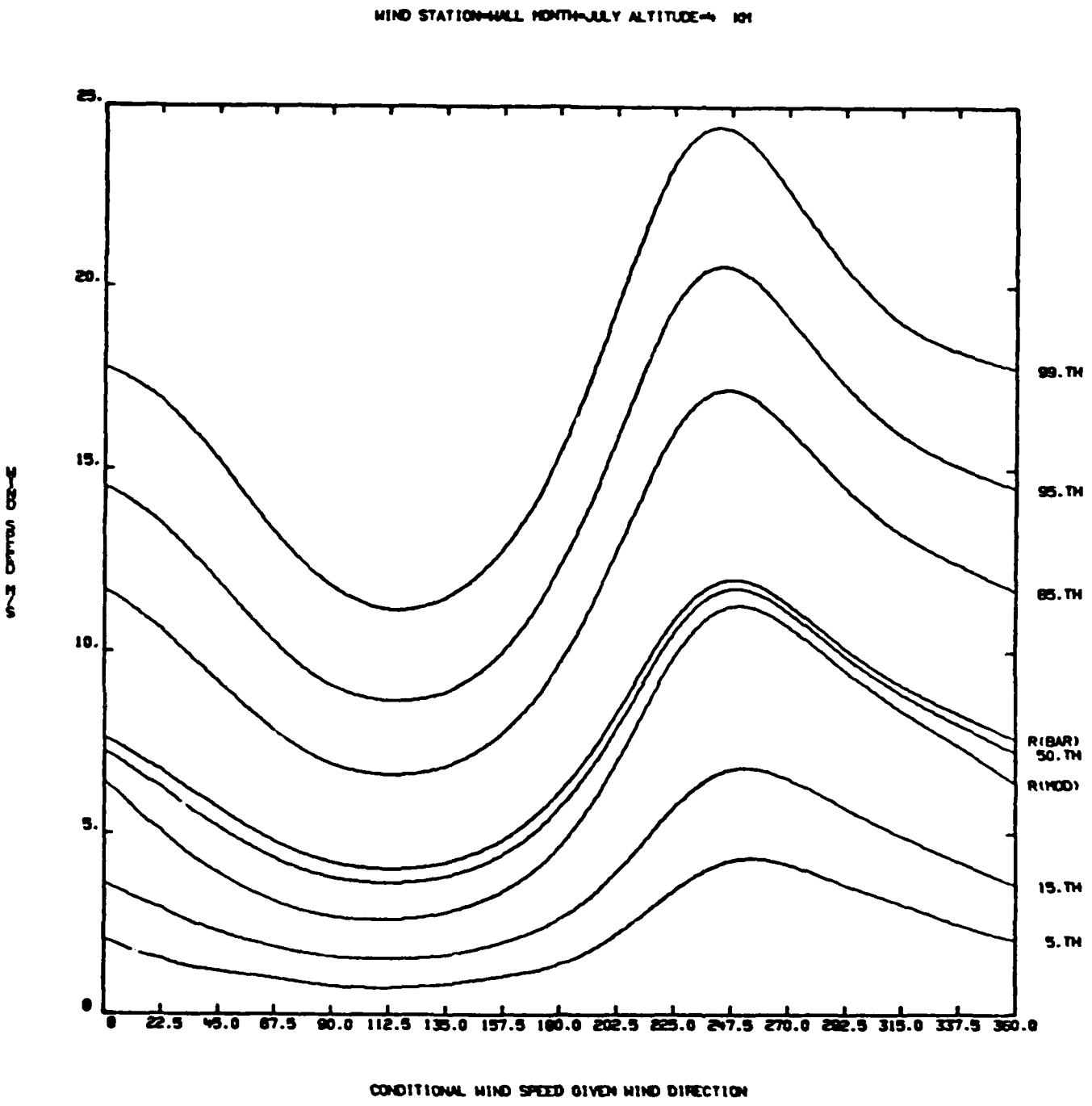

WIND STATION=HALL MONTH=JULY ALTITUDE=4 KM
25.
20.
15.
10.
5.
0
WIND SPEED M/S
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
360.0
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-57.

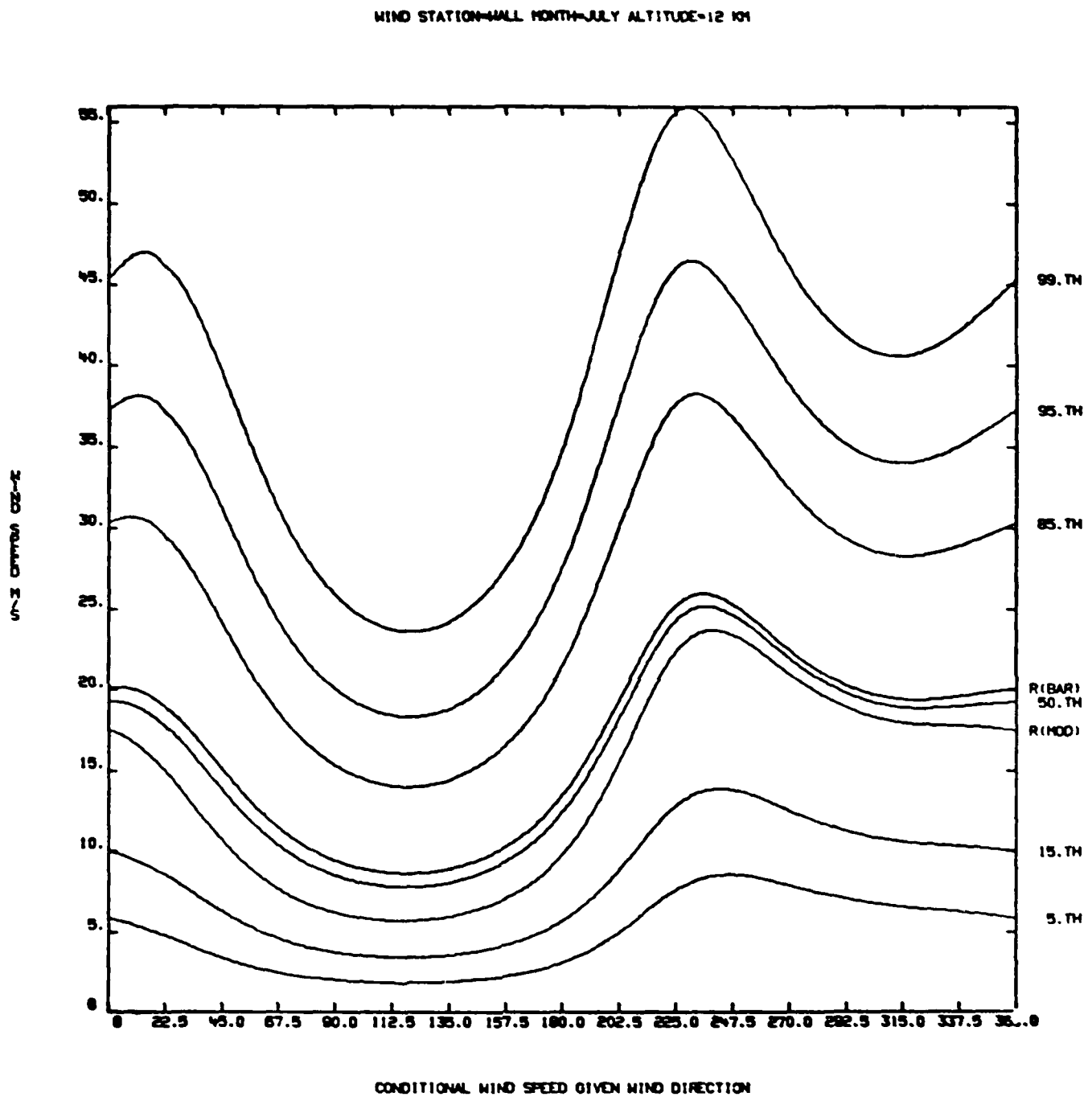

WIND STATION=WALL MONTH=JULY ALTITUDE=12 KM
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
0
5.
10.
15.
20.
25.
30.
35.
40.
45.
50.
55.
0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-58.

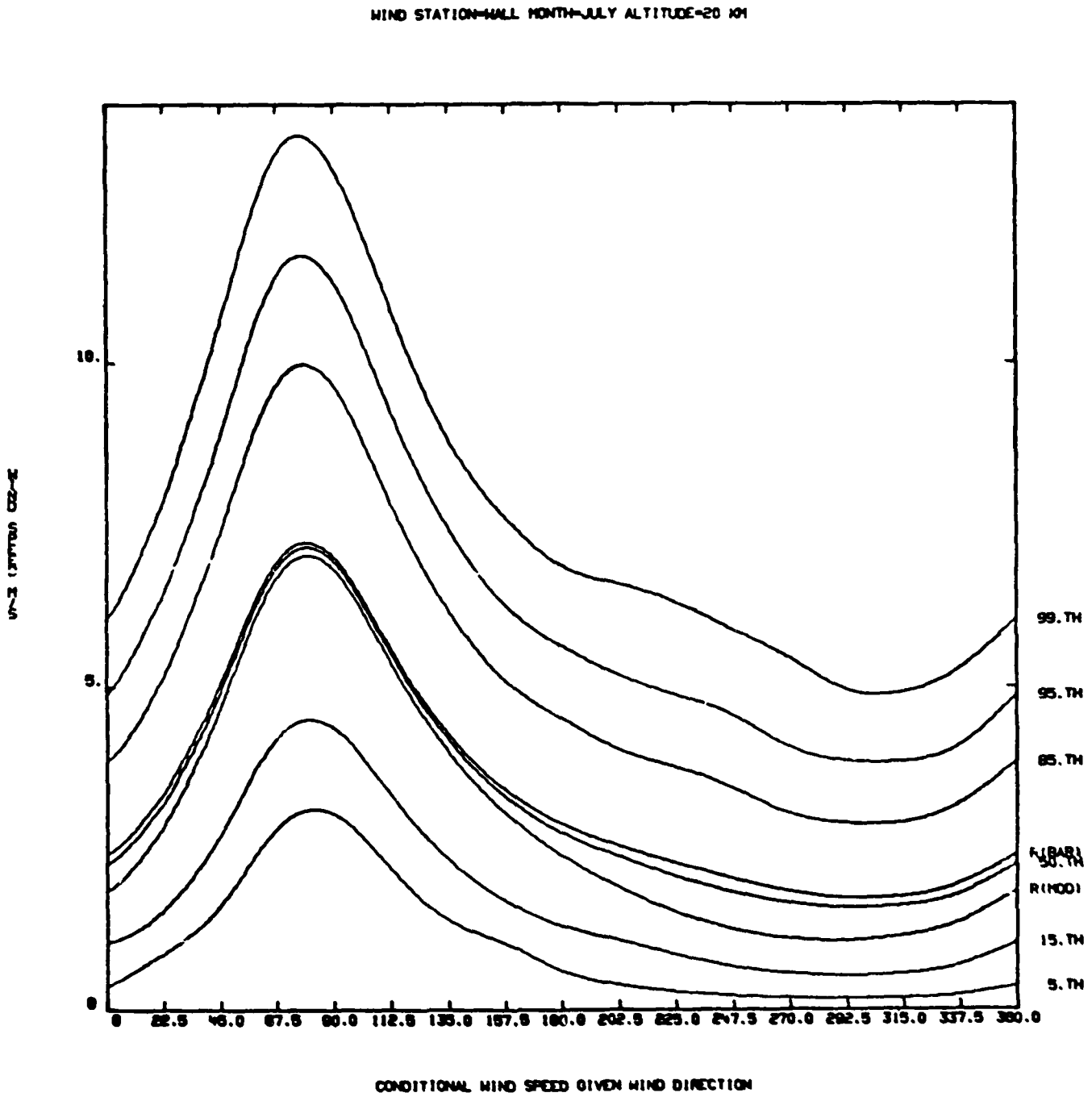

WIND STATION=HALL MONTH=JULY ALTITUDE=20 KM
10.
5.
0
99.TH
95.TH
85.TH
50.TH
15.TH
5.TH
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-59.

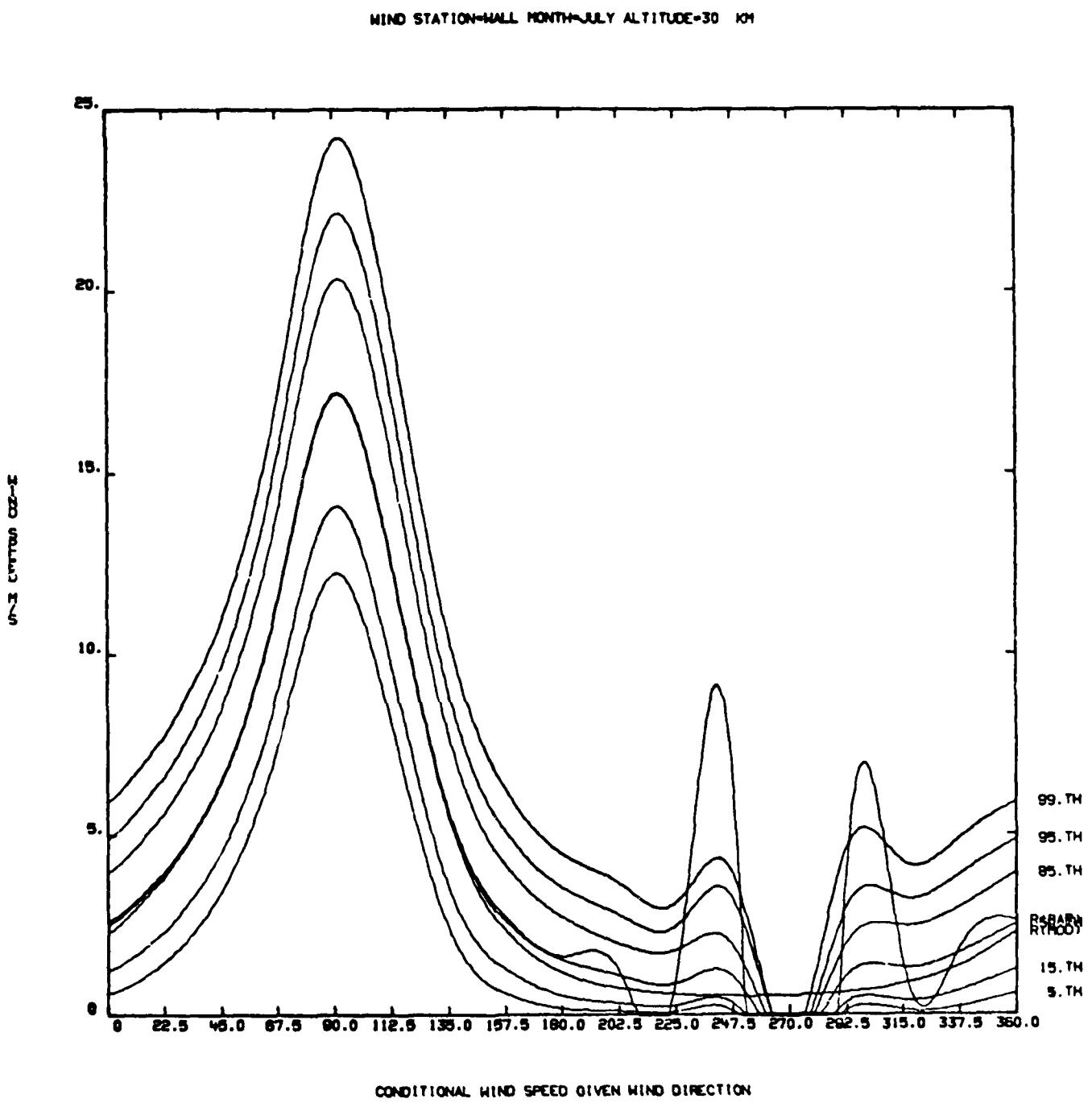

WIND STATION=WALL MONTH=JULY ALTITUDE=30 KM
25.
20.
15.
10.
5.
0
0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
360.0
99.TH
95.TH
85.TH
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-60.

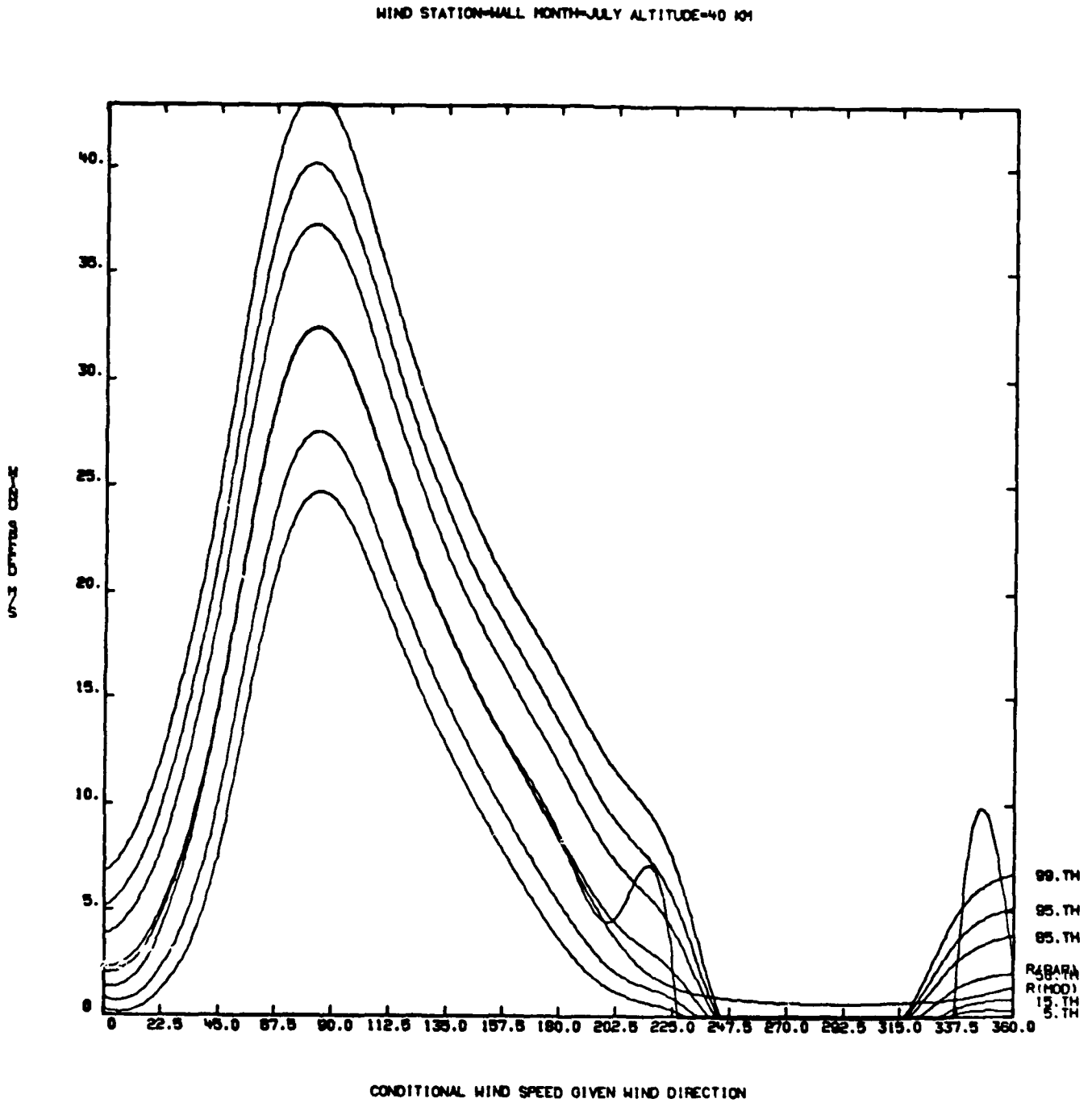

WIND STATION=WALL MONTH=JULY ALTITUDE=40 KM
40.
35.
30.
25.
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
50.TH
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-61.

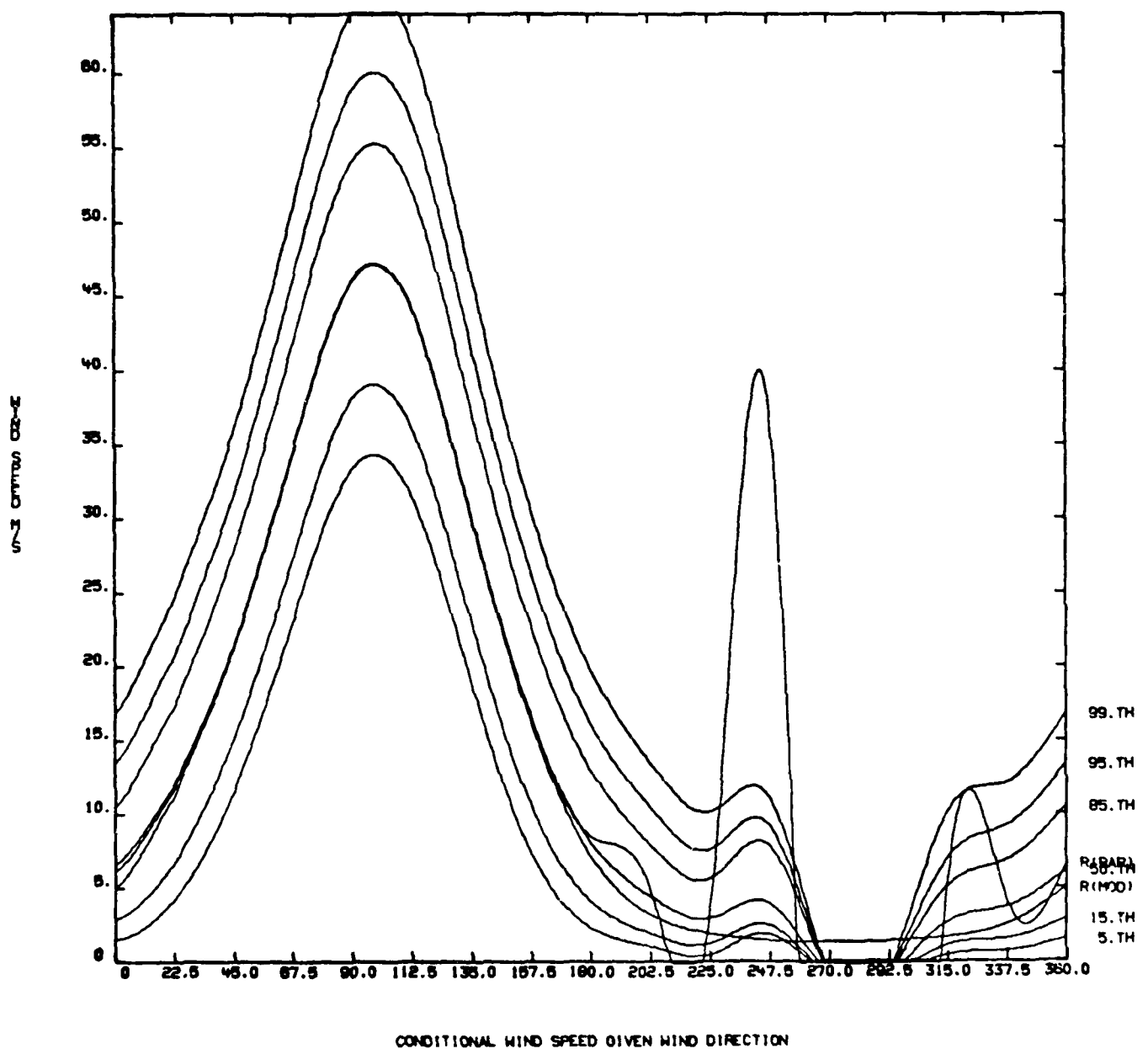

WIND STATION=HALL MONTH=JULY ALTITUDE=50 KM
M/S
60.
55.
50.
45.
40.
35.
30.
25.
20.
15.
10.
5.
0
0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
360.0
99.TH
95.TH
85.TH
50.TH
15.TH
5.TH
R(BAR)
R(MOD)
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-62.

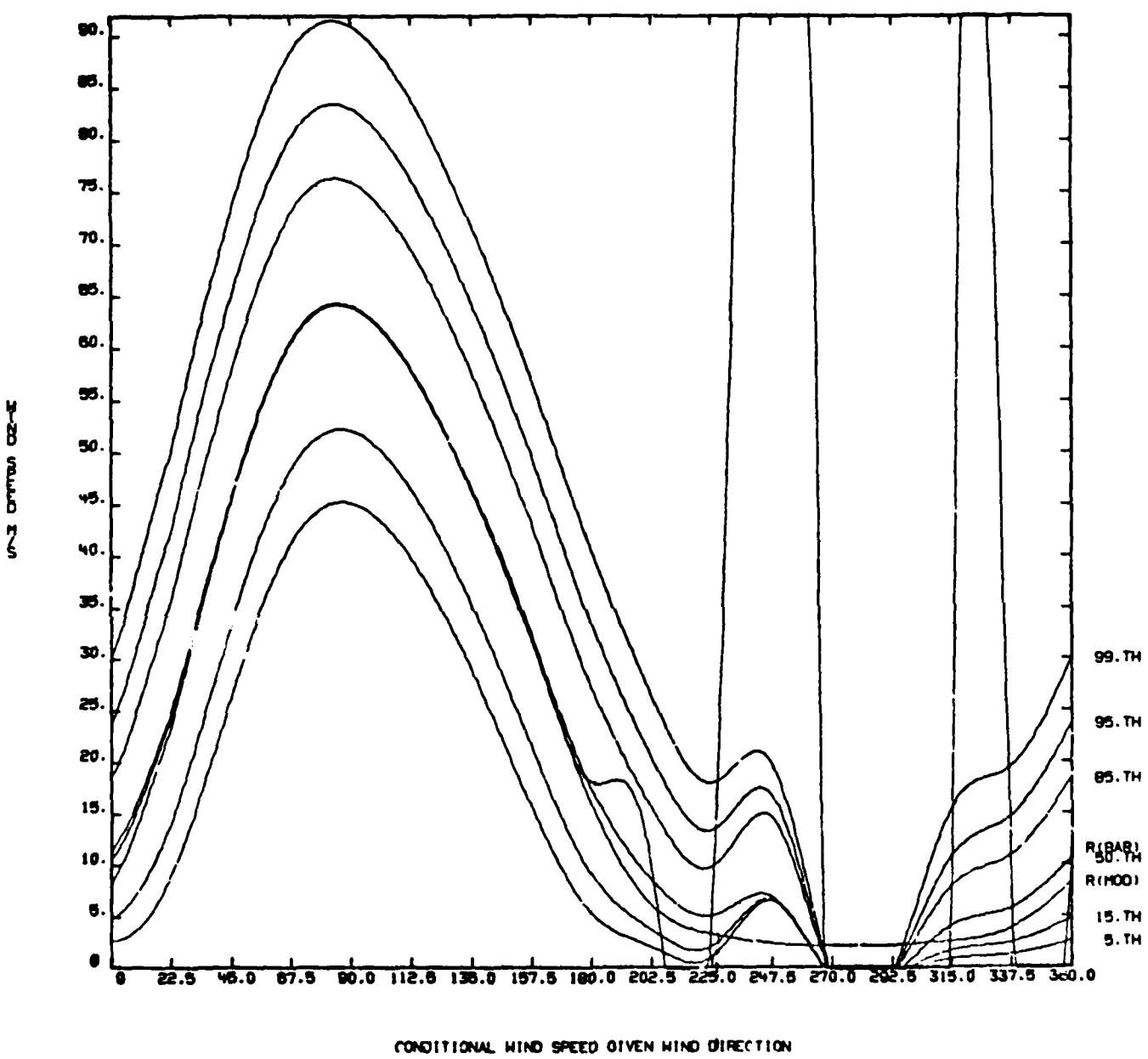

WIND STATION=HALL MONTH=JULY ALTITUDE=60 KM
WIND SPEED M/S
90.
85.
80.
75.
70.
65.
60.
55.
50.
45.
40.
35.
30.
25.
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-63.

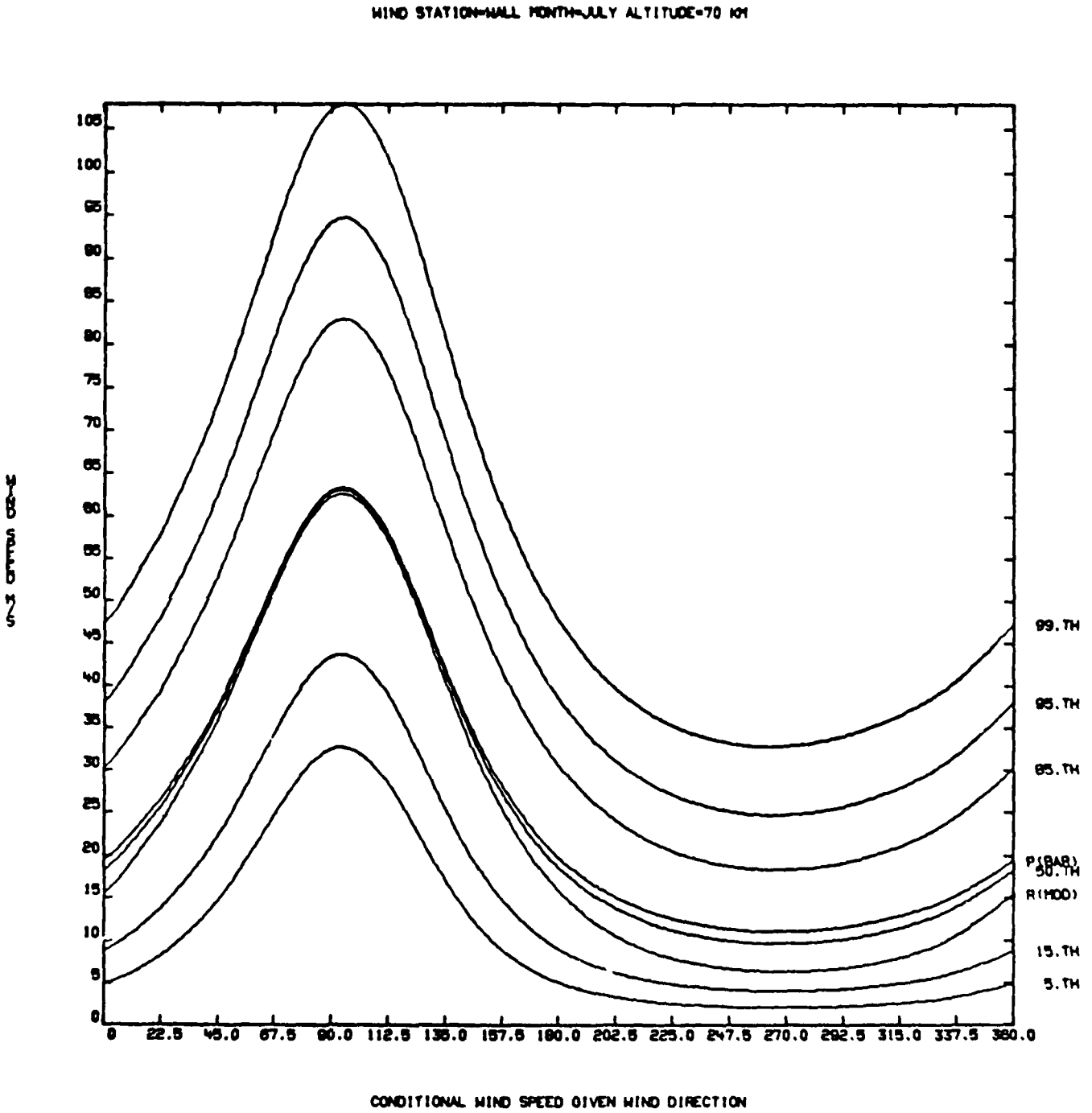

WIND STATION=HALL MONTH=JULY ALTITUDE=70 KM
WIND SPEED M/S
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
360.0
99.TH
95.TH
85.TH
P(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Figure A-64.

APPENDIX B

RANGE SPECIFIC INFORMATION AND THERMODYNAMIC QUANTITIES FOR WALLOPS ISLAND, VIRGINIA

1. Range Specific Information

To prevent further character size reductions for tables I through IV, certain range-specific information has been omitted. This important information is given in table B-1.

TABLE B-1

Header Record 0-30 Km		Header Record 32-70 Km	
Table Number	0	Table Number	0
Data Source (1=DATSAV, 2=WDC-A)	1	Data Source (1=DATSAV, 2=WDC-A)	2
Call Letters	WAL	Call Letters	WAL
WMO Number	72402	WMO Number	72402
Latitude	37°,51'	Latitude	37°,51'
Direction (N or S)	N	Direction (N or S)	N
Longitude	75°,29'	Longitude	75°,29'
Direction (E or W)	W	Direction (E or W)	W
Elevation in Meters	3	Elevation in Meters	3
Start Period or Record (Mo-Yr)	164	Start Period of Record (Mo-Yr)	169
End Period of Record (Mo-Yr)	1279	End Period of Record (Mo-Yr)	1278
No. of Time Windows (0, 1 or 2)	1	No. of Time Windows (0, 1 or 2)	1
Start Time Window No. 1 (Hr-MNZ)	1200	Start Time Window No. 1 (Hr-MNZ)	1200
End Time Window No. 1	2000	End Time Window No. 1	2000
Start Time Window No. 2	0	Start Time Window No. 2	0
End Time Window No. 2	0	End Time Window No. 2	0
Date of RRA	1080	Date of RRA	1180
Altitude Range of RRA Low Level (km)	0	Altitude Range of RRA Low Level (km)	30
Altitude Range of RRA High Level (km)	30	Altitude Range of RRA High Level (km)	70
Standard Deviation of Thermodynamic Limits	6.0	Standard Deviation of Thermodynamic Limits	6.0
Wind Limits	6.0	Wind Limits	6.0

2. Thermodynamic Quantities

This section presents examples of further computations and graphical displays of pressure, density, and virtual temperature statistics that can be derived from the data given in tables II, III, and IV. No attempt is made to present complete nor exhaustive illustrations that can be made to aid in visualizing the relationships that can be made from the data in tables II and IV. The choices are those that aided the committee to verify the reasonableness of the tabulations.

2.1 Monthly Means from the Annual Mean

The hydrostatic model values in table IV are used to compute (1) the monthly mean differences relative to the annual mean values of pressure, density, and virtual temperature expressed in percent and (2) the monthly mean difference in virtual temperature for the annual mean virtual temperature expressed in degrees Kelvin. Examples of these four statistics are given in table B-2 for January and table B-3 for July. Graphical displays of the four statistics contained in tables B-2 and B-3 are shown in figures B-1 through B-8. Also, the four the relative differences between the monthly mean values from table IV-1 through IV-12 for all months from the annual mean values (table IV-13) are illustrated in figure B-9 for pressure, in figure B-10 for density, and in figure B-11 for virtual temperature. The monthly mean virtual temperature differences from the annual mean virtual temperature for all months are given in figure B-12. The simple sum of the monthly mean differences from the annual mean values of these quantities is not zero. This is because the annual mean statistical parameters are computed (see section C of text) by weighting the monthly means by the number of observations in each month.

2.2 Coefficients of Variation and Derived Correlation Coefficients

The coefficient of variation, C_V, is defined by the standard deviation with respect to the mean divided by the mean. The coefficients of variation for pressure, C_VP, and density, C_VD, were computed using the standard deviations from table II and the hydrostatic mean values from table IV. The coefficient of variation for temperature uses the standard deviations of virtual temperature from table III to the altitude where virtual temperature exists. Above this altitude, the standard deviations of temperature are from table II. The mean values for temperature (virtual temperature to the altitude where it exists) are taken from table IV. No distinction is made in the table headings in table B-4 (January) and table B-5 (July) and all related figures between virtual temperature and temperature.

From the coefficients of variation for pressure, density, and temperature (virtual temperature to the altitude where it exists), the correlation coefficients between these quantities are derived using Buell's method (see reference in text). The equations for these derived correlation coefficients are

$$r(P,T) = \frac{(C_VT)^2 + (C_VP)^2 - (C_VD)^2}{2[C_VT \cdot C_VP]} \quad . \tag{B-1}$$

$$r(P,D) = \frac{(C_VD)^2 - (C_VT)^2 + (C_VP)^2}{2[C_VD \cdot C_VP]} \quad . \tag{B-2}$$

$$r(T,D) = \frac{(C_VP)^2 - (C_VD)^2 - (C_VT)^2}{2[C_VT \cdot C_VD]} \quad . \tag{B-3}$$

The correlation coefficients in tables B-4 and B-5 are derived from the above equations.

A test for the validity of the derived correlation coefficients is that all three of the following inequalities be satisfied.

$$C_V P - (C_V D + C_V T] < 0$$

$$C_V D - [C_V T + C_V P] < 0 \qquad \text{(B-4)}$$

$$C_V T - [C_V P + C_V D] < 0$$

In these examples (tables B-4 and B-5) the numerical values from equation (B-4) are all negative; hence, the derived correlation test is considered valid. The rare exceptions to this test for several RRAs occur at the extreme highest altitudes, where samples sizes for the statistical sample are small.

The statistical parameters from table B-4 (January) and table B-5 (July) are illustrated in figures B-13 through B-16.

For all months the $C_V P$ values are shown in figures B-17, the $C_V D$ values are shown in figure B-18, and $C_V T$ values are shown in figure B-19. If the abscissa on the figures for the coefficient of variation were multiplied by 100, these figures would show the percentage of the random dispersion of these quantities over the month with respect to the monthly mean for these thermodynamic quantities.

The derived correlation coefficients for all months are illustrated in the following figures:

a) Figure B-20 gives r(P,D).

b) Figure B-21 gives r(P,T).

c) Figure B-22 gives r(T,D).

TABLE B-2.

STATION 724020 MONTH 1
DELTAS IN PERCENT RELATIVE TO ANNUAL

LEVEL	PRESSURE	DENSITY	TEMP.	TMO-TANN(DEG.K)
.000	.14	4.44	-4.20	-12.02
.003	.13	4.52	-4.20	-12.03
1.000	-.35	3.33	-3.56	-10.08
2.000	-.75	2.18	-2.92	-8.13
3.000	-1.10	1.52	-2.59	-7.09
4.000	-1.43	1.16	-2.55	-6.85
5.000	-1.76	.88	-2.61	-6.87
6.000	-2.11	.64	-2.75	-7.04
7.000	-2.49	.31	-2.79	-6.96
8.000	-2.87	-.06	-2.80	-6.80
9.000	-3.27	-.60	-2.69	-6.32
10.000	-3.63	-1.32	-2.36	-5.38
11.000	-3.93	-2.28	-1.71	-3.81
12.000	-4.11	-3.56	-.59	-1.28
13.000	-4.11	-4.61	.53	1.14
14.000	-4.00	-4.90	.94	2.00
15.000	-3.87	-4.60	.80	1.70
16.000	-3.77	-4.19	.43	.90
17.000	-3.74	-3.66	-.06	-.12
18.000	-3.79	-3.30	-.50	-1.06
19.000	-3.89	-3.06	-.82	-1.75
20.000	-4.03	-3.07	-.98	-2.11
21.000	-4.19	-3.07	-1.15	-2.49
22.000	-4.38	-3.14	-1.29	-2.79
23.000	-4.58	-3.25	-1.36	-2.98
24.000	-4.79	-3.35	-1.49	-3.27
25.000	-5.03	-3.44	-1.64	-3.62
26.000	-5.27	-3.60	-1.73	-3.85
27.000	-5.54	-3.68	-1.94	-4.33
28.000	-5.82	-3.95	-1.97	-4.44
29.000	-6.10	-4.25	-1.93	-4.37
30.000	-6.37	-4.59	-1.84	-4.20
32.000	-6.86	-5.40	-1.63	-3.81
34.000	-7.25	-6.08	-1.28	-3.05
36.000	-7.53	-6.75	-.88	-2.13
38.000	-7.70	-7.34	-.45	-1.11
40.000	-7.76	-7.74	-.07	-.17
42.000	-7.70	-8.25	.56	1.46
44.000	-7.56	-8.16	.61	1.62
46.000	-7.46	-7.74	.24	.65
48.000	-7.46	-7.25	-.25	-.67
50.000	-7.63	-6.53	-1.16	-3.11
52.000	-7.98	-6.31	-1.82	-4.85
54.000	-8.41	-6.74	-1.84	-4.86
56.000	-8.87	-7.04	-2.02	-5.27
58.000	-9.34	-7.68	-1.84	-4.74
60.000	-9.76	-8.28	-1.67	-4.24
62.000	-10.16	-8.71	-1.63	-4.04
64.000	-10.54	-9.27	-1.44	-3.49
66.000	-10.84	-10.03	-.92	-2.18
68.000	-11.11	-10.09	-1.23	-2.84
70.000	-11.45	-10.30	-1.33	-2.96

TABLE B-3.

STATION 724020 MONTH 7
DELTAS IN PERCENT RELATIVE TO ANNUAL

LEVEL	PRESSURE	DENSITY	TEMP.	TMO-TANN(DEG.K)
.000	-.11	-4.11	4.09	11.70
.003	-.11	-4.04	4.08	11.69
1.000	.33	-3.06	3.54	10.04
2.000	.71	-2.15	2.93	8.17
3.000	1.05	-1.57	2.67	7.31
4.000	1.38	-1.21	2.62	7.05
5.000	1.72	-1.02	2.78	7.30
6.000	2.10	-.90	3.03	7.76
7.000	2.52	-.72	3.25	8.11
8.000	2.98	-.38	3.39	8.21
9.000	3.46	.04	3.40	8.01
10.000	3.94	.74	3.17	7.25
11.000	4.38	1.81	2.52	5.61
12.000	4.69	3.34	1.30	2.83
13.000	4.79	4.86	-.08	-.17
14.000	4.69	5.77	-1.00	-2.12
15.000	4.50	5.90	-1.32	-2.78
16.000	4.31	5.20	-.88	-1.85
17.000	4.22	4.46	-.19	-.39
18.000	4.23	3.92	.30	.63
19.000	4.32	3.61	.67	1.43
20.000	4.45	3.48	.94	2.01
21.000	4.62	3.42	1.16	2.50
22.000	4.82	3.43	1.34	2.91
23.000	5.05	3.50	1.51	3.30
24.000	5.31	3.56	1.69	3.72
25.000	5.59	3.69	1.82	4.02
26.000	5.89	3.92	1.92	4.26
27.000	6.20	4.12	1.97	4.41
28.000	6.50	4.46	1.96	4.42
29.000	6.81	4.76	1.95	4.42
30.000	7.11	5.07	1.95	4.45
32.000	7.64	5.77	1.49	3.49
34.000	8.07	6.37	1.31	3.11
36.000	8.46	6.84	1.27	3.08
38.000	8.76	7.61	.82	2.03
40.000	8.95	8.13	.51	1.30
42.000	9.11	8.22	.59	1.54
44.000	9.27	8.42	.54	1.43
46.000	9.43	8.46	.65	1.75
48.000	9.60	8.69	.62	1.66
50.000	9.75	9.11	.42	1.13
52.000	9.84	9.28	.27	.72
54.000	9.85	9.81	-.21	-.56
56.000	9.74	10.10	-.58	-1.51
58.000	9.47	10.64	-1.31	-3.37
60.000	8.98	10.98	-2.06	-5.22
62.000	8.24	11.28	-2.97	-7.38
64.000	7.31	10.61	-3.19	-7.74
66.000	6.38	9.24	-2.85	-6.75
68.000	5.49	8.36	-2.89	-6.69
70.000	4.60	7.22	-2.68	-5.98

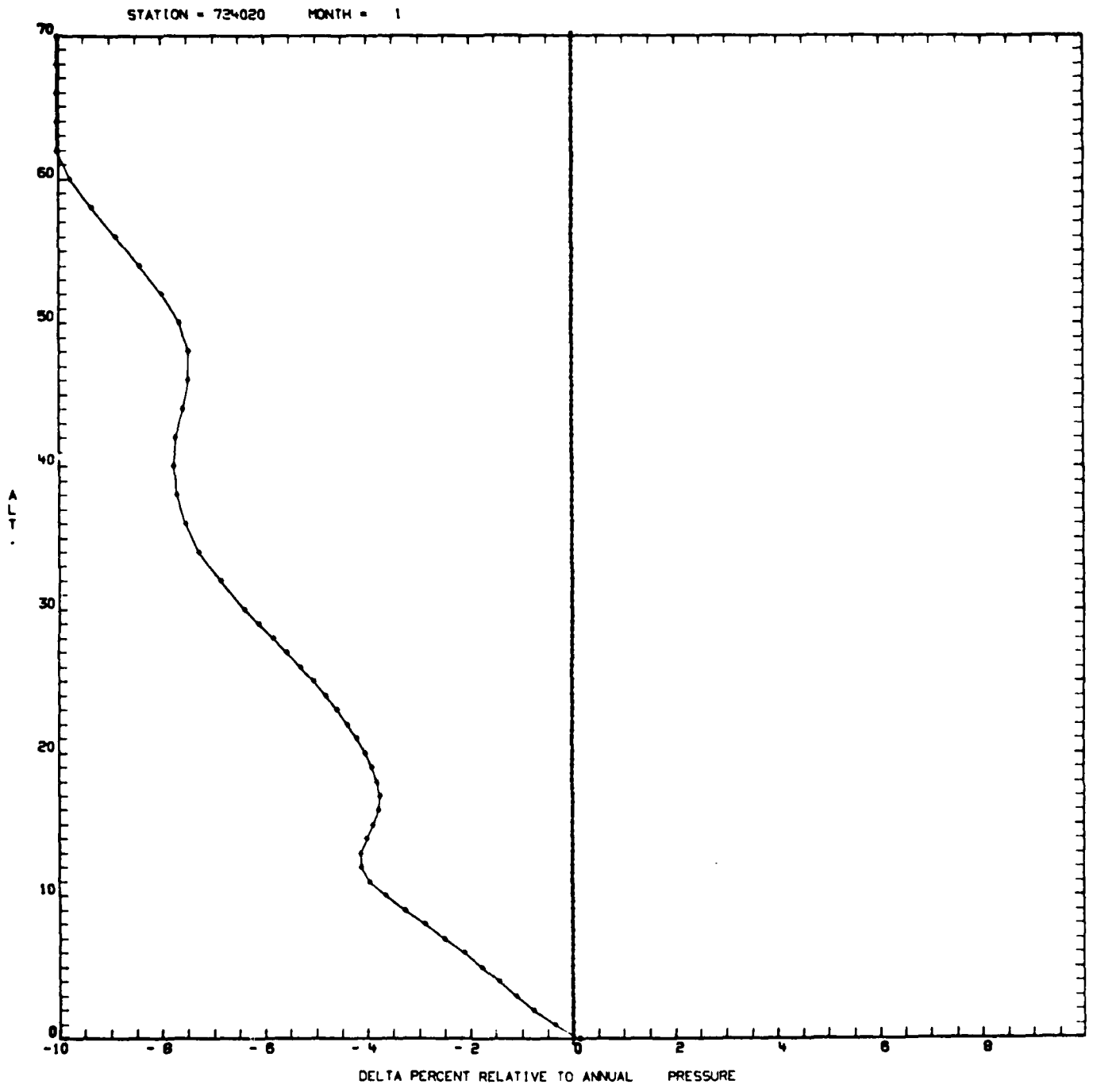
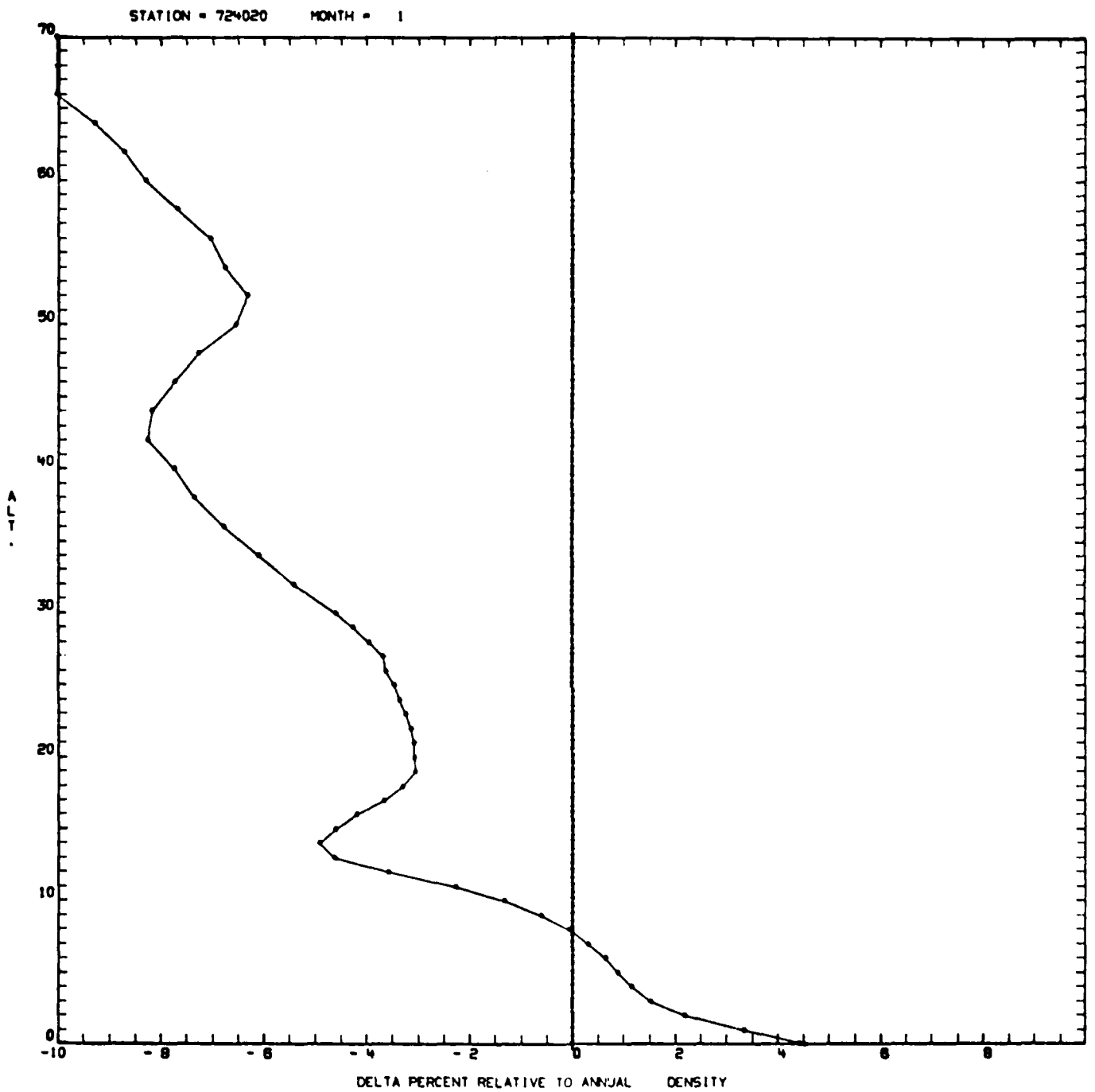


Figure B-1.

Figure B-1.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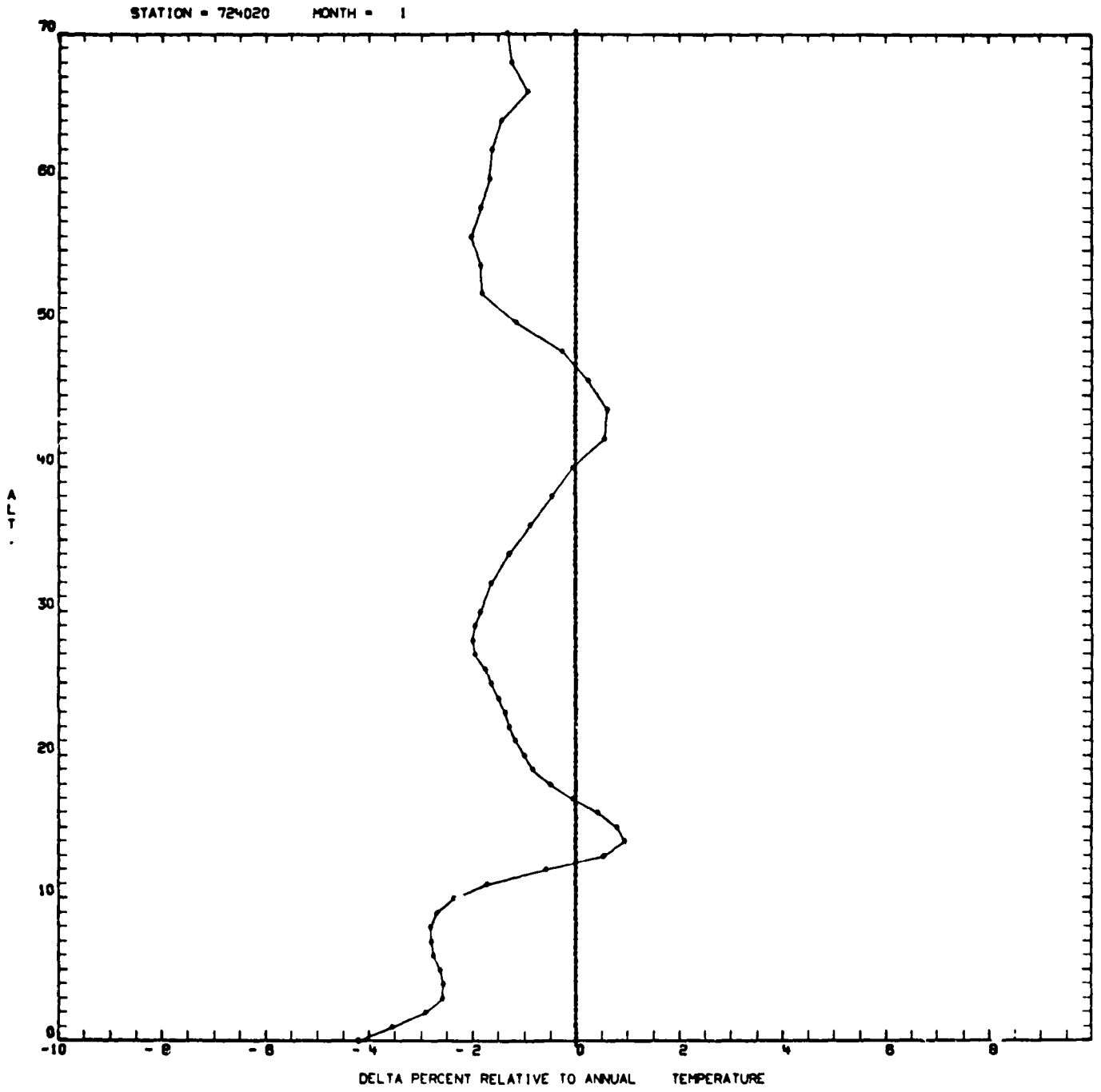
40
30
20
10
0
ALT
-10
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL DENSITY

Figure B-2.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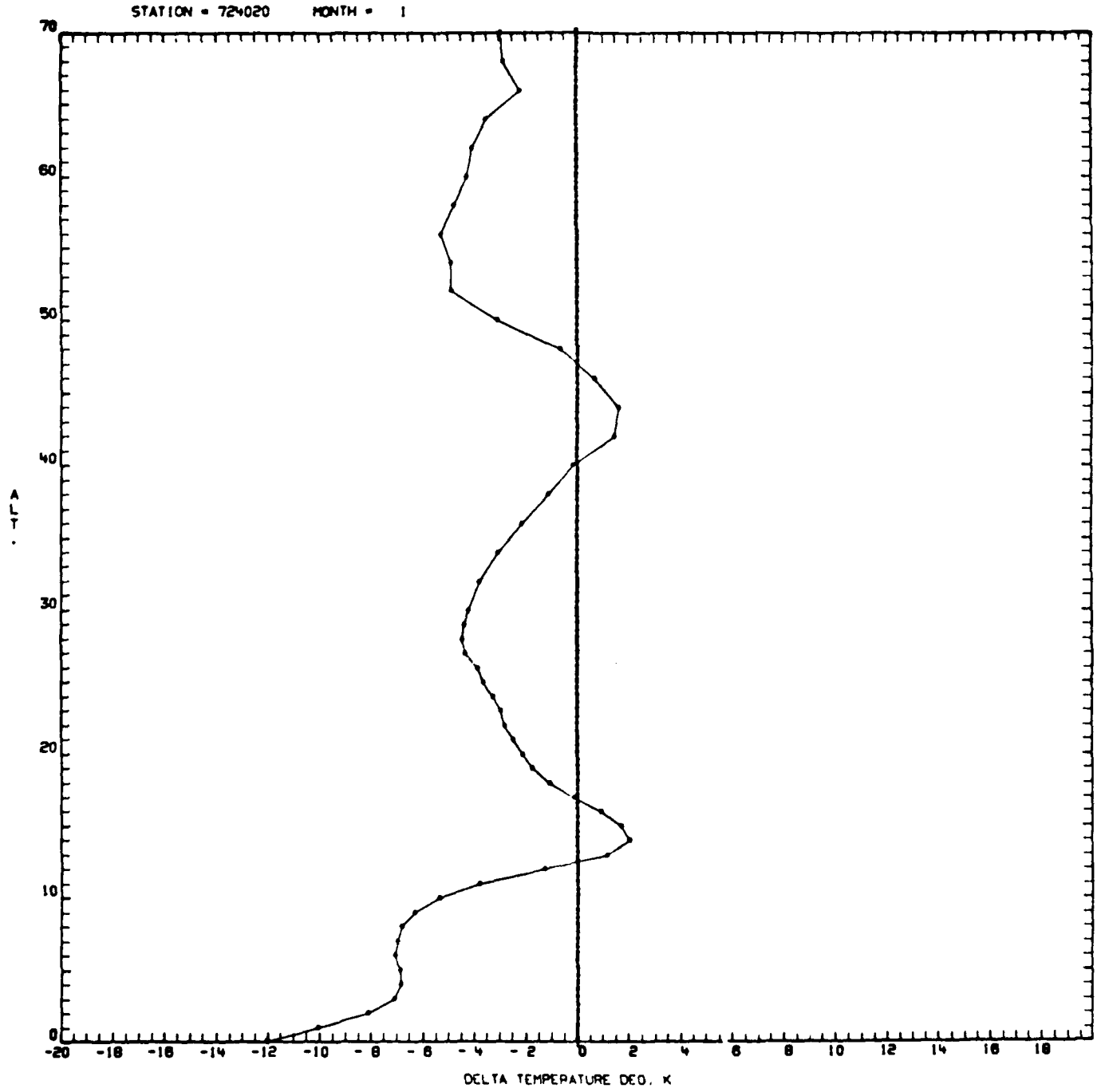
50
40
30
20
10
0
ALT.
-10
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL TEMPERATURE

Figure B-3.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50
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30
20
10
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ALT.
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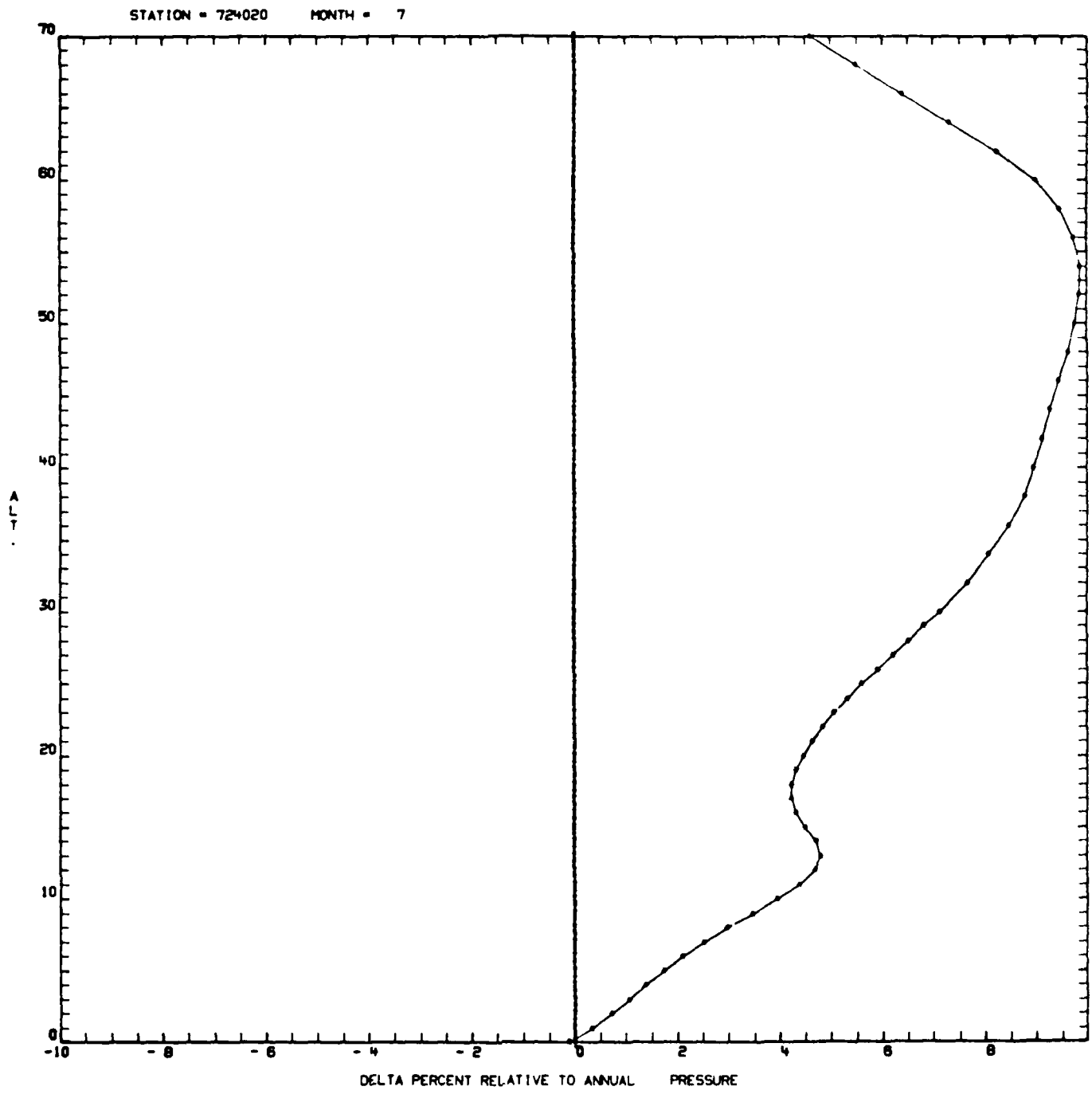
DELTA TEMPERATURE DEG. K

Figure B-4.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ALT.
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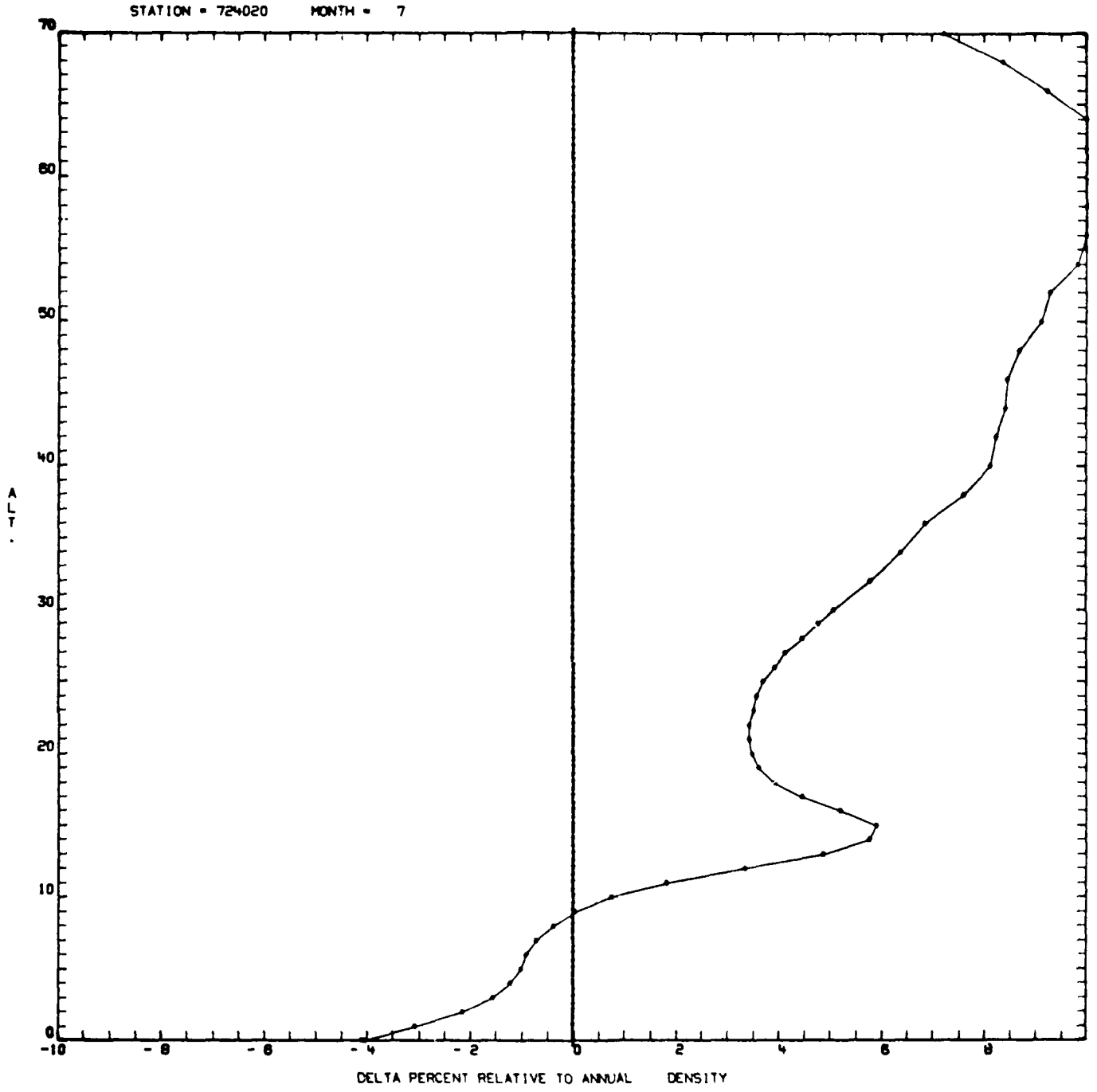
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL PRESSURE

Figure B-5.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50
40
30
20
10
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ALT.
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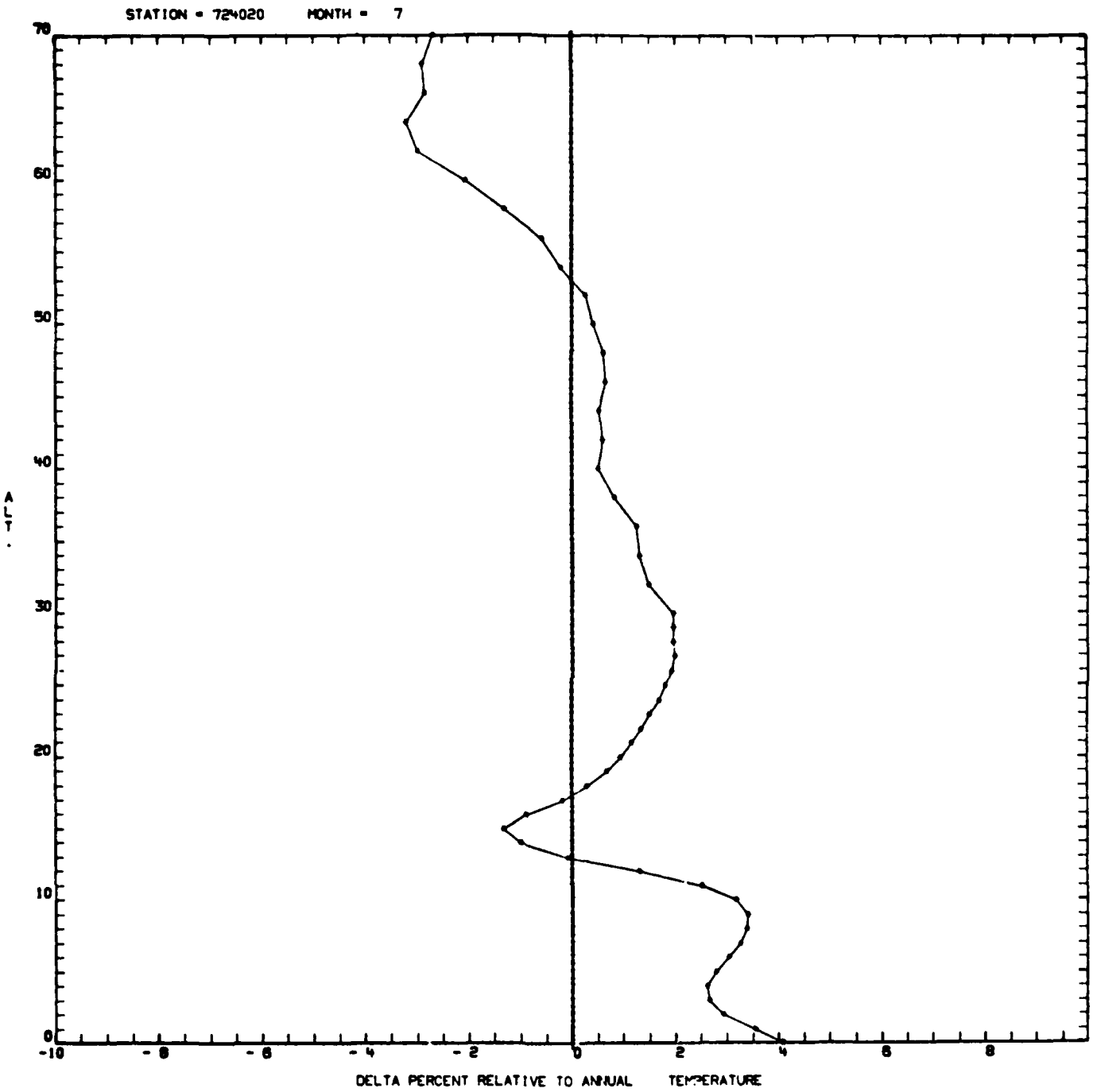
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL DENSITY

Figure B-6.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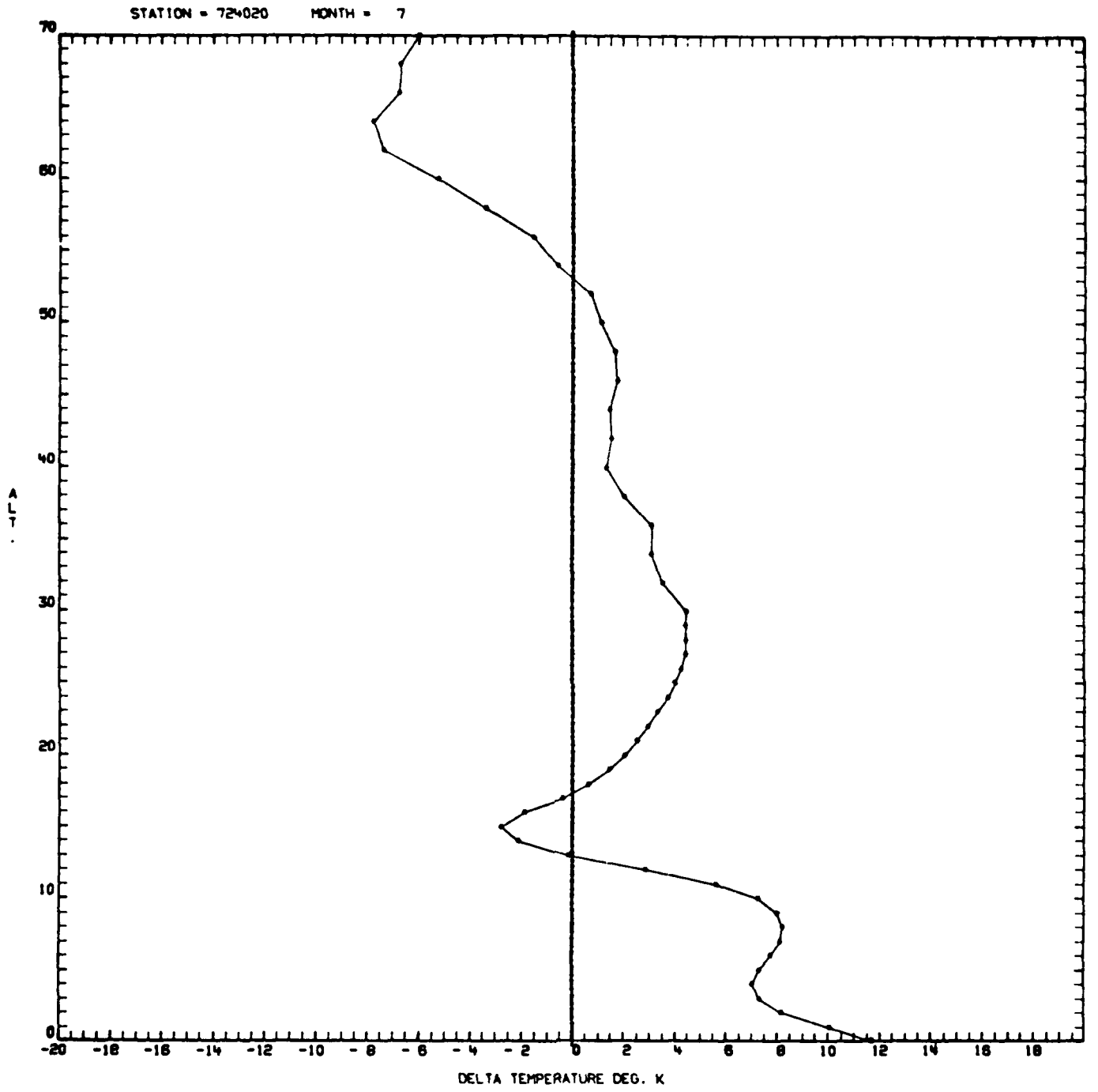
60
50
40
30
20
10
0
ALT.
-10
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL TEMPERATURE

Figure B-7.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50
40
30
20
10
0
ALT
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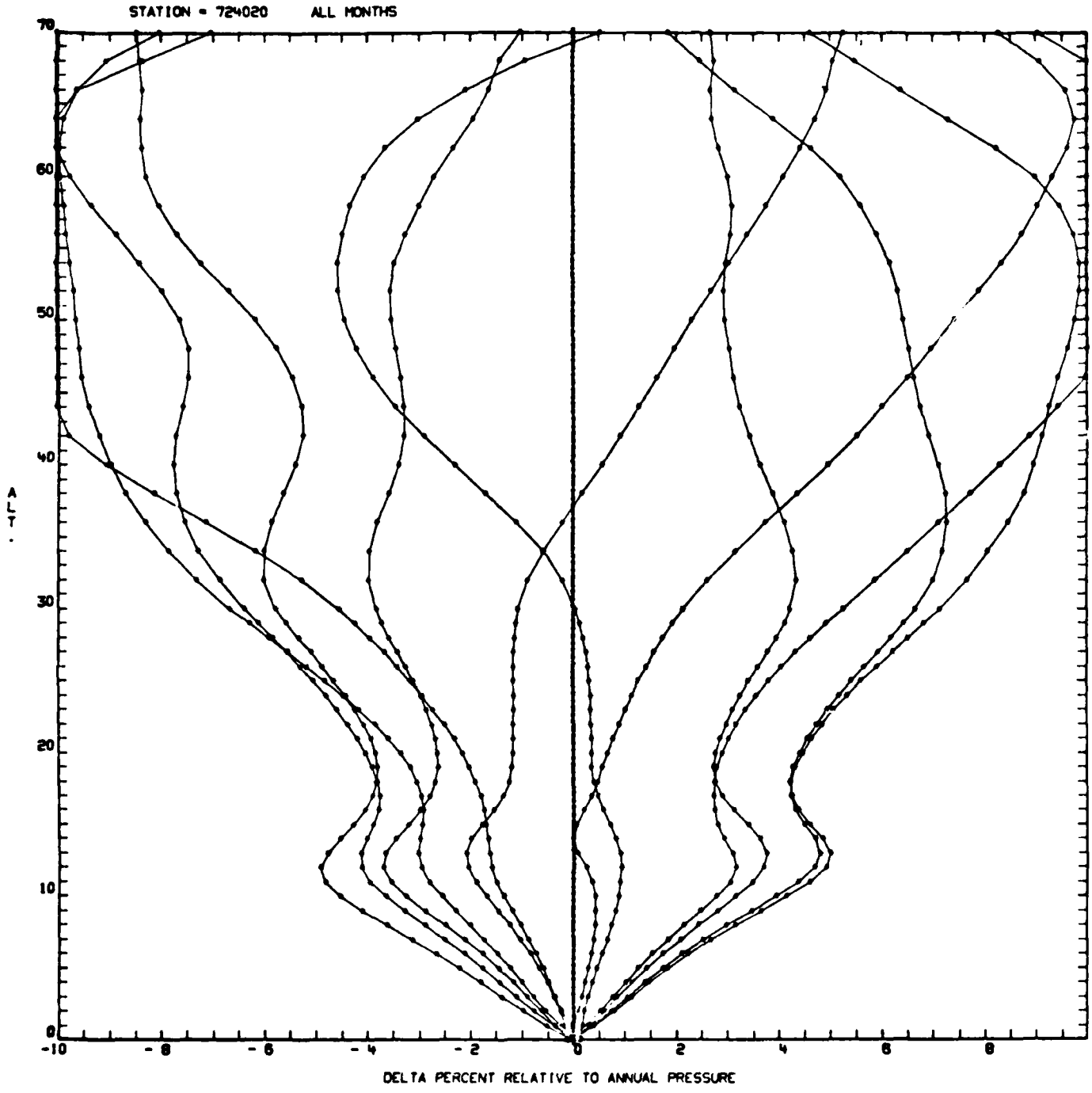
DELTA TEMPERATURE DEG. K

Figure B-8.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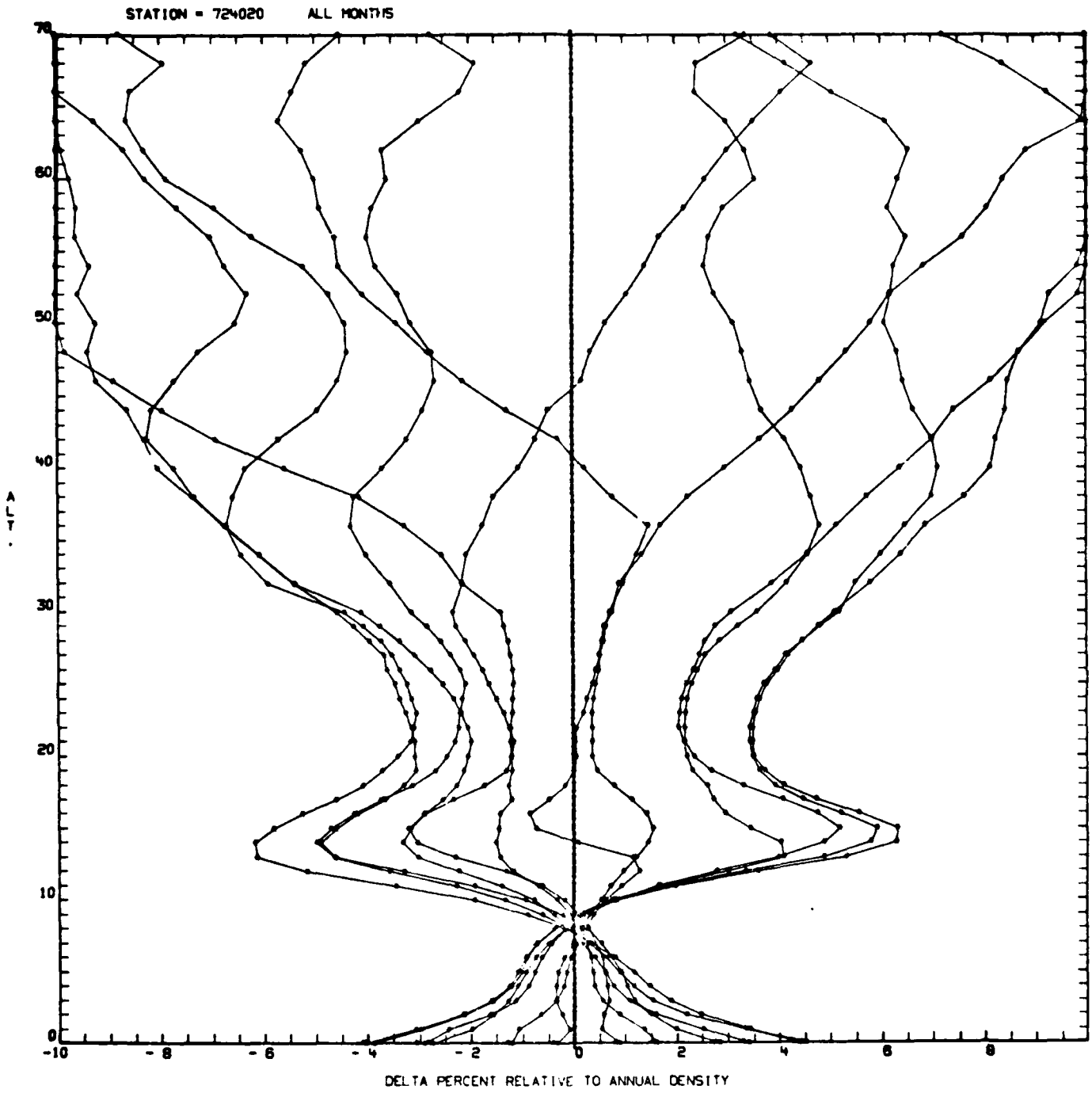
60
50
40
30
20
10
0
ALT
-10
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL PRESSURE

Figure B-9.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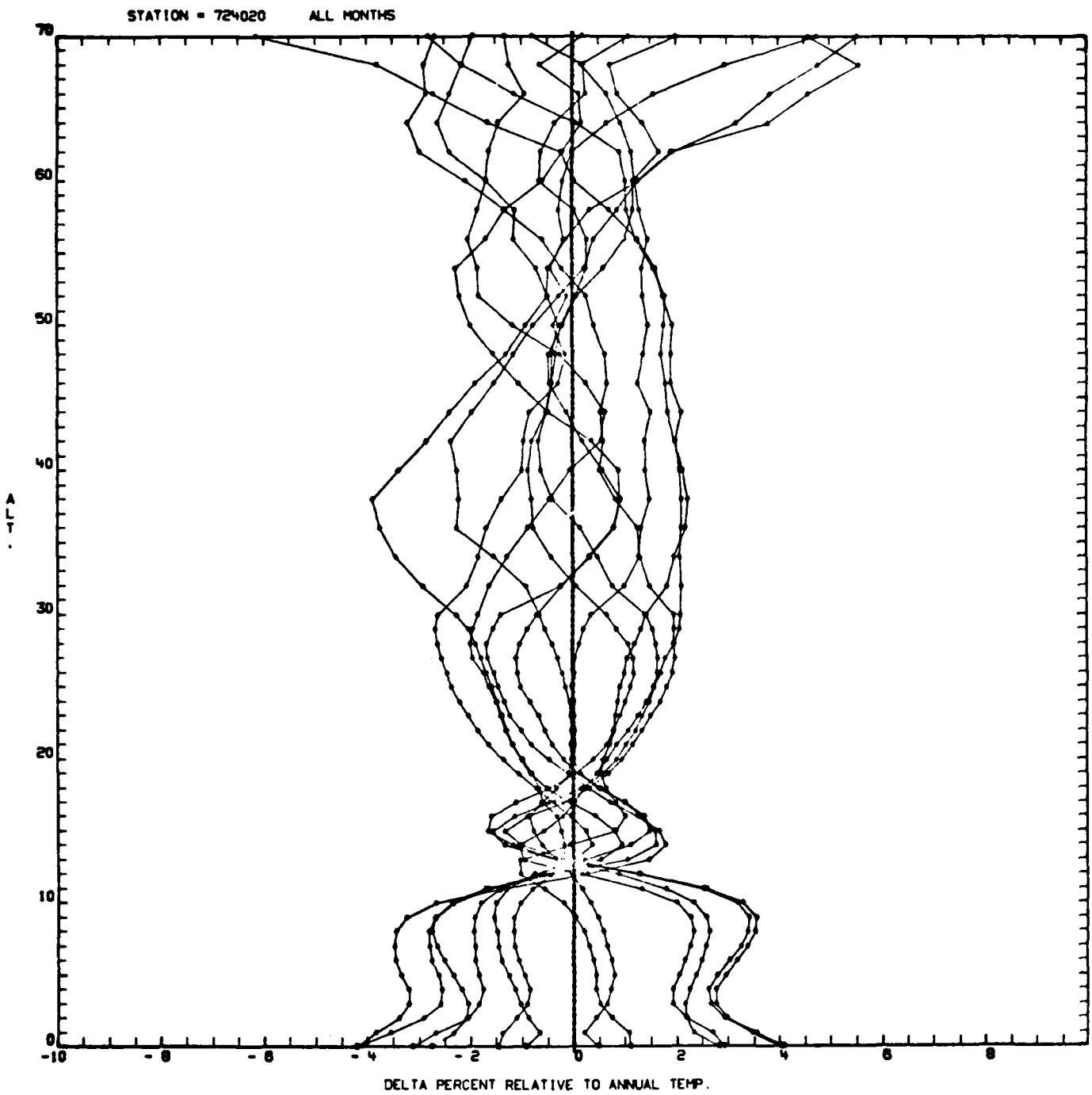
60
50
40
30
20
10
0
ALT.
-10
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL DENSITY

Figure B-10.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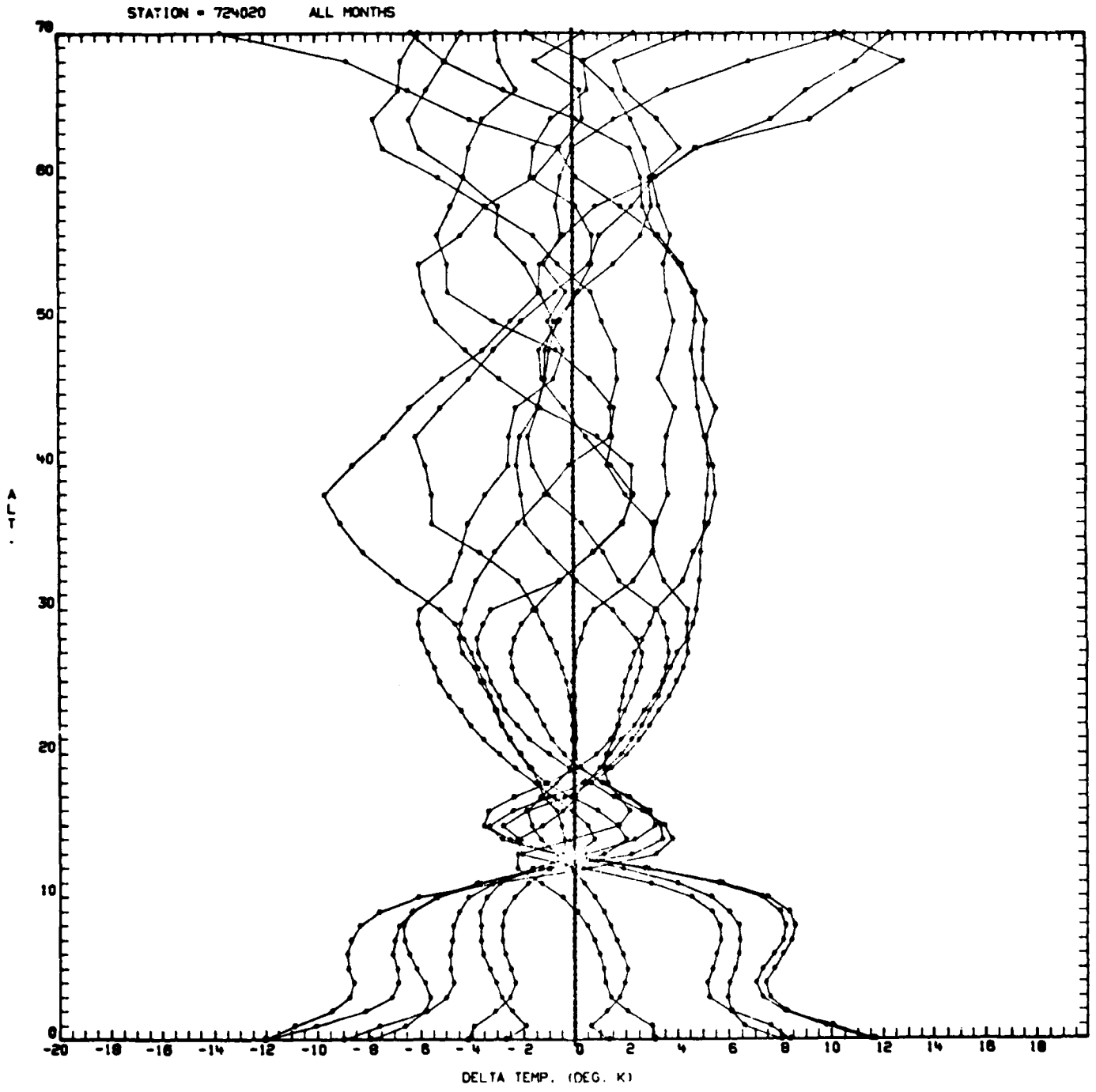
60
50
40
30
20
10
0
ALT.
-10
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL TEMP.

Figure B-11.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50
40
30
20
10
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ALT.
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DELTA TEMP. (DEG. K)

Figure B-12.

TABLE B-4.

STATION 724020 MONTH 1

LEVEL	CVP	CVD	CVT	R(P,T)	R(P,D)	R(T,D)	DCVP	DCVD	DCVT
.000	.0090	.0260	.0213	-.3738	.6504	-.9476	-.0383	-.0042	-.0137
.003	.0090	.0260	.0213	-.3756	.6523	-.9475	-.0383	-.0042	-.0137
1.000	.0088	.0296	.0298	.1628	.1330	-.9563	-.0506	-.0089	-.0087
2.000	.0102	.0228	.0268	.5513	-.2016	-.9283	-.0395	-.0142	-.0062
3.000	.0124	.0177	.0246	.7312	-.3183	-.8794	-.0300	-.0193	-.0055
4.000	.0149	.0149	.0242	.8130	-.3230	-.8137	-.0243	-.0242	-.0056
5.000	.0177	.0129	.0240	.8506	-.2152	-.6966	-.0193	-.0287	-.0066
6.000	.0205	.0121	.0246	.8715	-.0799	-.5584	-.0162	-.0329	-.0080
7.000	.0232	.0119	.0235	.8699	.2280	-.2820	-.0123	-.0348	-.0116
8.000	.0260	.0147	.0216	.8244	.5577	-.0100	-.0103	-.0329	-.0191
9.000	.0282	.0215	.0183	.6487	.7602	-.0013	-.0116	-.0251	-.0314
10.000	.0292	.0312	.0165	.1532	.8537	-.3838	-.0185	-.0144	-.0439
11.000	.0288	.0418	.0215	-.3554	.8773	-.7673	-.0345	-.0085	-.0490
12.000	.0272	.0481	.0272	-.5573	.8824	-.8824	-.0481	-.0064	-.0481
13.000	.0250	.0435	.0242	-.5643	.8887	-.8800	-.0426	-.0057	-.0444
14.000	.0233	.0372	.0191	-.5427	.9027	-.8513	-.0330	-.0051	-.0414
15.000	.0215	.0352	.0180	-.5779	.9083	-.8663	-.0317	-.0044	-.0387
16.000	.0197	.0336	.0181	-.5792	.8987	-.8780	-.0320	-.0042	-.0353
17.000	.0183	.0322	.0184	-.5400	.8764	-.8786	-.0324	-.0045	-.0321
18.000	.0169	.0292	.0176	-.4328	.8395	-.8532	-.0299	-.0053	-.0285
19.000	.0159	.0256	.0157	-.3129	.8130	-.8074	-.0254	-.0060	-.0258
20.000	.0152	.0233	.0153	-.1720	.7625	-.7685	-.0235	-.0071	-.0232
21.000	.0148	.0225	.0163	-.0446	.6904	-.7535	-.0240	-.0086	-.0210
22.000	.0148	.0217	.0175	.1003	.6001	-.7357	-.0244	-.0105	-.0190
23.000	.0152	.0210	.0185	.2368	.5176	-.7087	-.0242	-.0127	-.0177
24.000	.0163	.0200	.0192	.3754	.4551	-.6545	-.0229	-.0155	-.0171
25.000	.0176	.0190	.0196	.4827	.4282	-.5847	-.0210	-.0182	-.0170
26.000	.0190	.0183	.0192	.5423	.4703	-.4864	-.0185	-.0199	-.0181
27.000	.0200	.0183	.0188	.5597	.5197	-.4171	-.0171	-.0206	-.0195
28.000	.0218	.0193	.0193	.5658	.5641	-.3617	-.0168	-.0218	-.0218
29.000	.0233	.0213	.0199	.5257	.6028	-.3618	-.0179	-.0220	-.0246
30.000	.0253	.0241	.0210	.4710	.6395	-.3770	-.0198	-.0222	-.0284
32.000	.0310	.0327	.0264	.3586	.6578	-.4672	-.0282	-.0247	-.0373
34.000	.0335	.0380	.0294	.2756	.6678	-.5315	-.0339	-.0249	-.0420
36.000	.0362	.0376	.0288	.3480	.6951	-.4321	-.0303	-.0274	-.0449
38.000	.0383	.0443	.0309	.1955	.7291	-.5287	-.0369	-.0250	-.0517
40.000	.0405	.0453	.0346	.2806	.6799	-.5131	-.0394	-.0298	-.0512
42.000	.0431	.0462	.0353	.3182	.6896	-.4671	-.0384	-.0322	-.0539
44.000	.0459	.0463	.0337	.3558	.7329	-.3751	-.0341	-.0333	-.0585
46.000	.0489	.0458	.0270	.3855	.8393	-.1781	-.0240	-.0301	-.0677
48.000	.0510	.0479	.0228	.3567	.8956	-.0961	-.0197	-.0259	-.0761
50.000	.0529	.0492	.0172	.3708	.9456	.0485	-.0135	-.0209	-.0848
52.000	.0529	.0494	.0226	.3642	.9049	-.0667	-.0190	-.0261	-.0798
54.000	.0551	.0531	.0258	.3132	.8967	-.1613	-.0238	-.0279	-.0824
56.000	.0562	.0541	.0273	.3203	.8785	-.1711	-.0251	-.0294	-.0830
58.000	.0605	.0558	.0298	.3982	.8717	-.1024	-.0251	-.0345	-.0855
60.000	.0651	.0591	.0335	.4274	.8585	-.0967	-.0276	-.0395	-.0907
62.000	.0587	.0514	.0318	.4861	.8418	-.0625	-.0245	-.0391	-.0784
64.000	.0643	.0546	.0376	.5313	.8117	-.0636	-.0279	-.0473	-.0813
66.000	.0609	.0576	.0417	.4193	.7536	-.2808	-.0384	-.0450	-.0768
68.000	.0730	.0646	.0455	.4861	.7881	-.1548	-.0371	-.0539	-.0921
70.000	.0850	.0752	.0399	.4670	.8831	-.0025	-.0301	-.0497	-.1203

TABLE B-5

STATION 724020 MONTH 7

LEVEL	CVP	CVD	CVT	R(P,T)	R(P,D)	R(T,D)	DCVP	DCVD	DCVT
.000	.0045	.0121	.0103	-.2000	.5442	-.9309	-.0179	-.0028	-.0062
.003	.0045	.0121	.0103	-.1978	.5428	-.9306	-.0179	-.0028	-.0062
1.000	.0042	.0121	.0108	-.1379	.4724	-.9381	-.0187	-.0029	-.0056
2.000	.0042	.0101	.0096	.1048	.3179	-.9096	-.0155	-.0038	-.0047
3.000	.0045	.0072	.0076	.3976	.2076	-.8150	-.0103	-.0050	-.0041
4.000	.0050	.0058	.0069	.5511	.2035	-.7048	-.0077	-.0060	-.0040
5.000	.0054	.0060	.0072	.5706	.2190	-.6763	-.0078	-.0066	-.0043
6.000	.0061	.0065	.0083	.6272	.1307	-.5902	-.0088	-.0079	-.0043
7.000	.0059	.0069	.0097	.7020	.0119	-.7038	-.0098	-.0097	-.0041
8.000	.0079	.0075	.0110	.7338	-.0303	-.7013	-.0106	-.0114	-.0043
9.000	.0090	.0076	.0119	.7712	-.0177	-.6501	-.0104	-.0133	-.0047
10.000	.0104	.0075	.0120	.7848	.1384	-.5051	-.0090	-.0149	-.0059
11.000	.0118	.0086	.0113	.7256	.4180	-.3218	-.0081	-.0145	-.0090
12.000	.0126	.0118	.0107	.4959	.6131	-.3820	-.0100	-.0115	-.0136
13.000	.0131	.0173	.0122	.0637	.7123	-.6551	-.0164	-.0080	-.0183
14.000	.0128	.0231	.0150	-.3736	.7964	-.8595	-.0253	-.0047	-.0208
15.000	.0115	.0253	.0171	-.5492	.8252	-.9252	-.0309	-.0033	-.0197
16.000	.0101	.0231	.0160	-.5338	.8034	-.9287	-.0290	-.0031	-.0172
17.000	.0090	.0179	.0125	-.3729	.7629	-.8844	-.0214	-.0036	-.0144
18.000	.0086	.0142	.0098	-.1873	.7342	-.8044	-.0154	-.0042	-.0130
19.000	.0084	.0118	.0087	.0501	.6763	-.7018	-.0121	-.0053	-.0115
20.000	.0085	.0105	.0080	.1850	.6707	-.6049	-.0100	-.0060	-.0111
21.000	.0088	.0097	.0075	.3079	.6723	-.4974	-.0084	-.0067	-.0110
22.000	.0090	.0093	.0072	.3557	.6890	-.4323	-.0076	-.0069	-.0111
23.000	.0094	.0092	.0068	.3938	.7347	-.3342	-.0065	-.0070	-.0118
24.000	.0098	.0092	.0067	.4459	.7581	-.2457	-.0059	-.0074	-.0124
25.000	.0104	.0095	.0068	.4590	.7677	-.2170	-.0059	-.0078	-.0131
26.000	.0109	.0097	.0070	.4882	.7741	-.1747	-.0058	-.0083	-.0135
27.000	.0114	.0104	.0075	.4590	.7704	-.2129	-.0064	-.0085	-.0144
28.000	.0117	.0102	.0071	.4998	.7986	-.1221	-.0056	-.0086	-.0148
29.000	.0121	.0107	.0077	.4894	.7769	-.1689	-.0064	-.0091	-.0151
30.000	.0129	.0111	.0083	.5257	.7669	-.1428	-.0065	-.0101	-.0156
32.000	.0207	.0182	.0110	.4802	.8490	-.0558	-.0085	-.0135	-.0280
34.000	.0234	.0189	.0125	.5929	.8454	.0711	-.0080	-.0170	-.0297
36.000	.0250	.0204	.0112	.5974	.8986	.1851	-.0056	-.0158	-.0343
38.000	.0270	.0219	.0123	.6042	.8947	.1846	-.0072	-.0174	-.0366
40.000	.0292	.0250	.0156	.5186	.8454	-.0183	-.0114	-.0199	-.0386
42.000	.0314	.0285	.0167	.4319	.8476	-.1125	-.0139	-.0196	-.0431
44.000	.0334	.0286	.0157	.5169	.8834	.0554	-.0109	-.0204	-.0463
46.000	.0356	.0301	.0153	.5470	.9046	.1379	-.0098	-.0208	-.0504
48.000	.0376	.0324	.0142	.5270	.9285	.1739	-.0090	-.0193	-.0559
50.000	.0392	.0351	.0151	.4527	.9235	.0760	-.0109	-.0192	-.0532
52.000	.0410	.0367	.0161	.4490	.9200	.0629	-.0118	-.0204	-.0617
54.000	.0436	.0380	.0183	.4925	.9076	.0816	-.0128	-.0239	-.0632
56.000	.0444	.0388	.0219	.4872	.8708	-.0051	-.0162	-.0275	-.0614
58.000	.0489	.0405	.0269	.5613	.8353	.0133	-.0185	-.0353	-.0625
60.000	.0507	.0344	.0318	.7427	.7860	.1697	-.0155	-.0480	-.0533
62.000	.0490	.0348	.0304	.7097	.7873	.1245	-.0162	-.0446	-.0533
64.000	.0514	.0371	.0338	.6929	.7535	.0481	-.0195	-.0481	-.0547
66.000	.0599	.0378	.0405	.7829	.7462	.1700	-.0184	-.0626	-.0573
68.000	.0748	.0476	.0527	.7738	.7137	.1087	-.0256	-.0798	-.0697
70.000	.0923	.0533	.0813	.8184	.4820	-.1090	-.0424	-.1202	-.0643

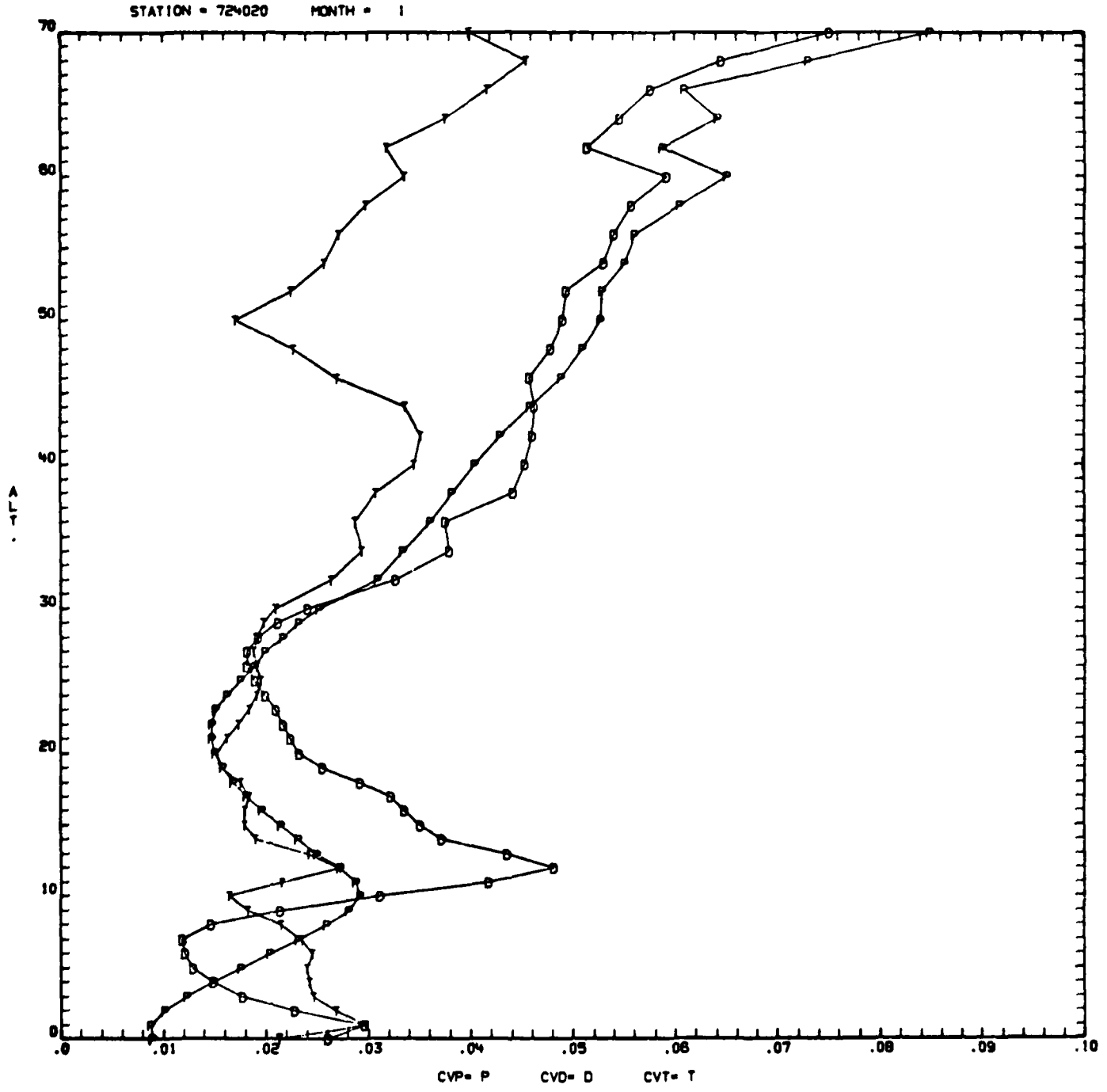
STATION = 724020 MONTH = 1
70
60
50
40
30
20
10
0
.0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.10
CVP= P
CVD= D
CVT= T

Figure B-13.

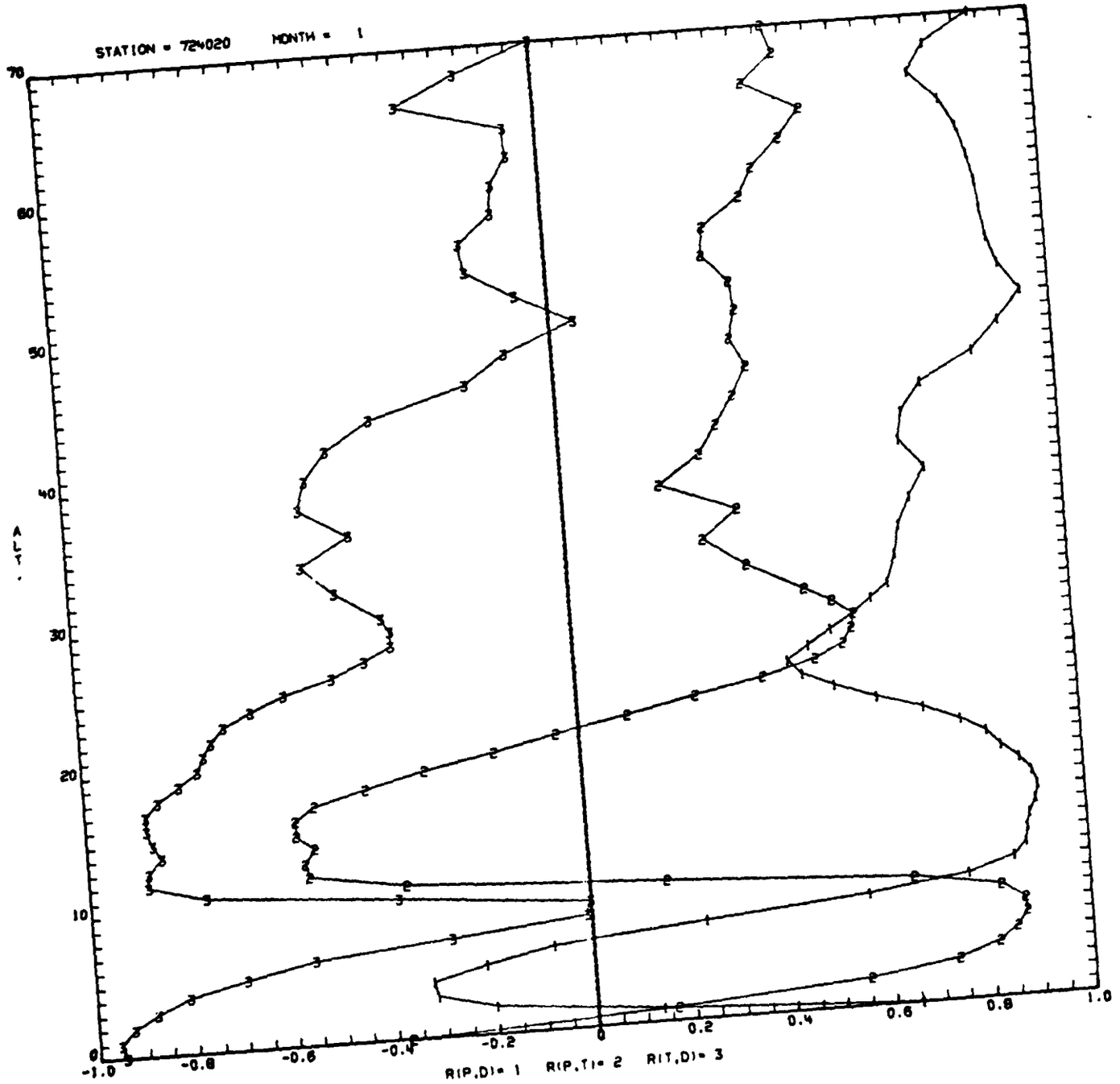
STATION = 724020
MONTH = 1
70
60
50
40
30
20
10
0
-1.0
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1.0
R(P,D)= 1
R(P,T)= 2
R(T,D)= 3

Figure B-14.

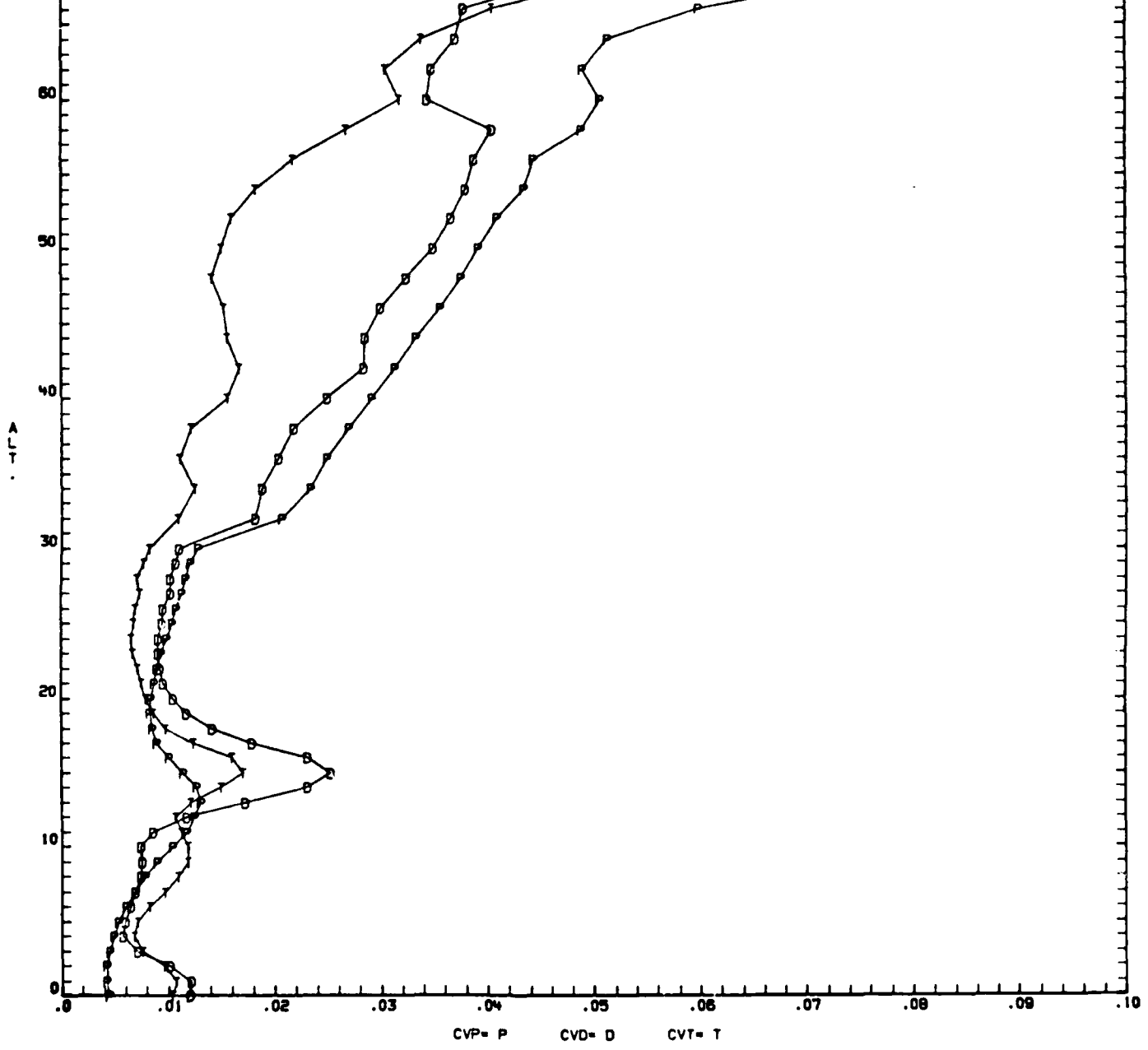
STATION = 724020
MONTH = 7
70
60
50
40
30
20
10
0
ALT.
.0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.10
CVP= P
CVD= D
CVT= T

Figure B-15.

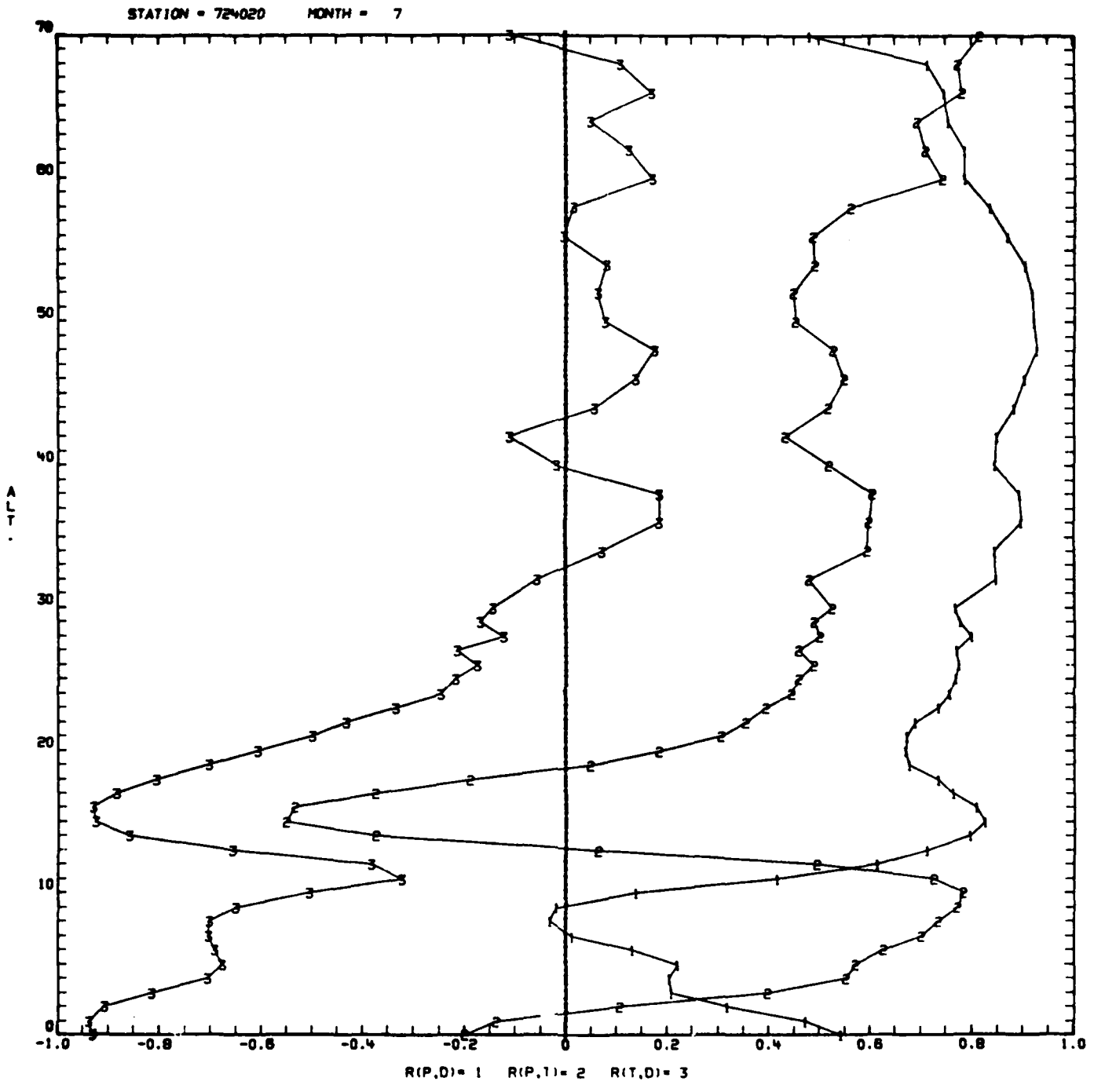
STATION = 724020 MONTH = 7
70
60
50
40
30
20
10
0
ALT
-1.0
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1.0
R(P,D)= 1 R(P,T)= 2 R(T,D)= 3

Figure B-16.

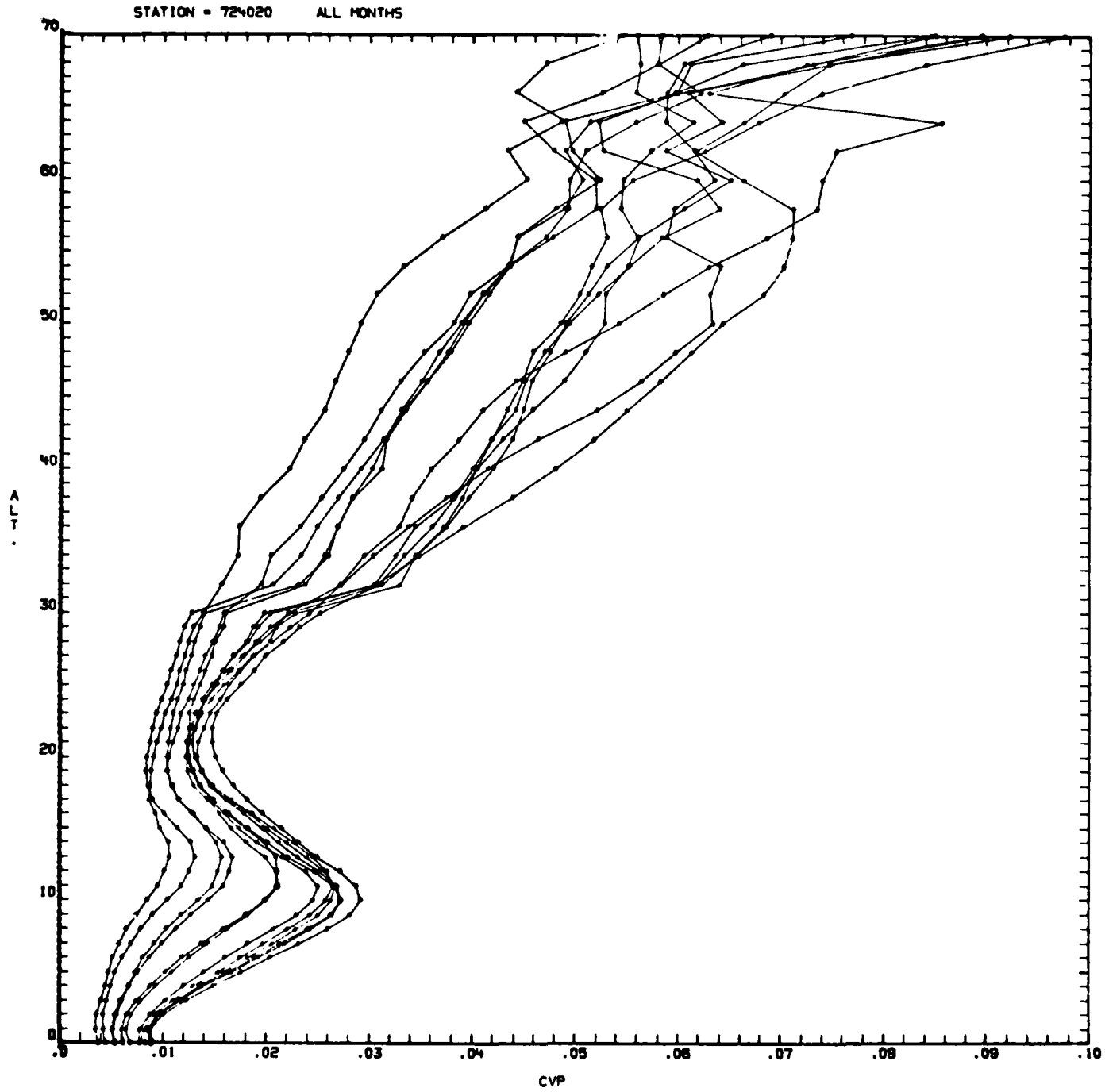
STATION = 724020 ALL MONTHS
70
60
50
40
30
20
10
0
.0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.10
CVP

Figure B-17.

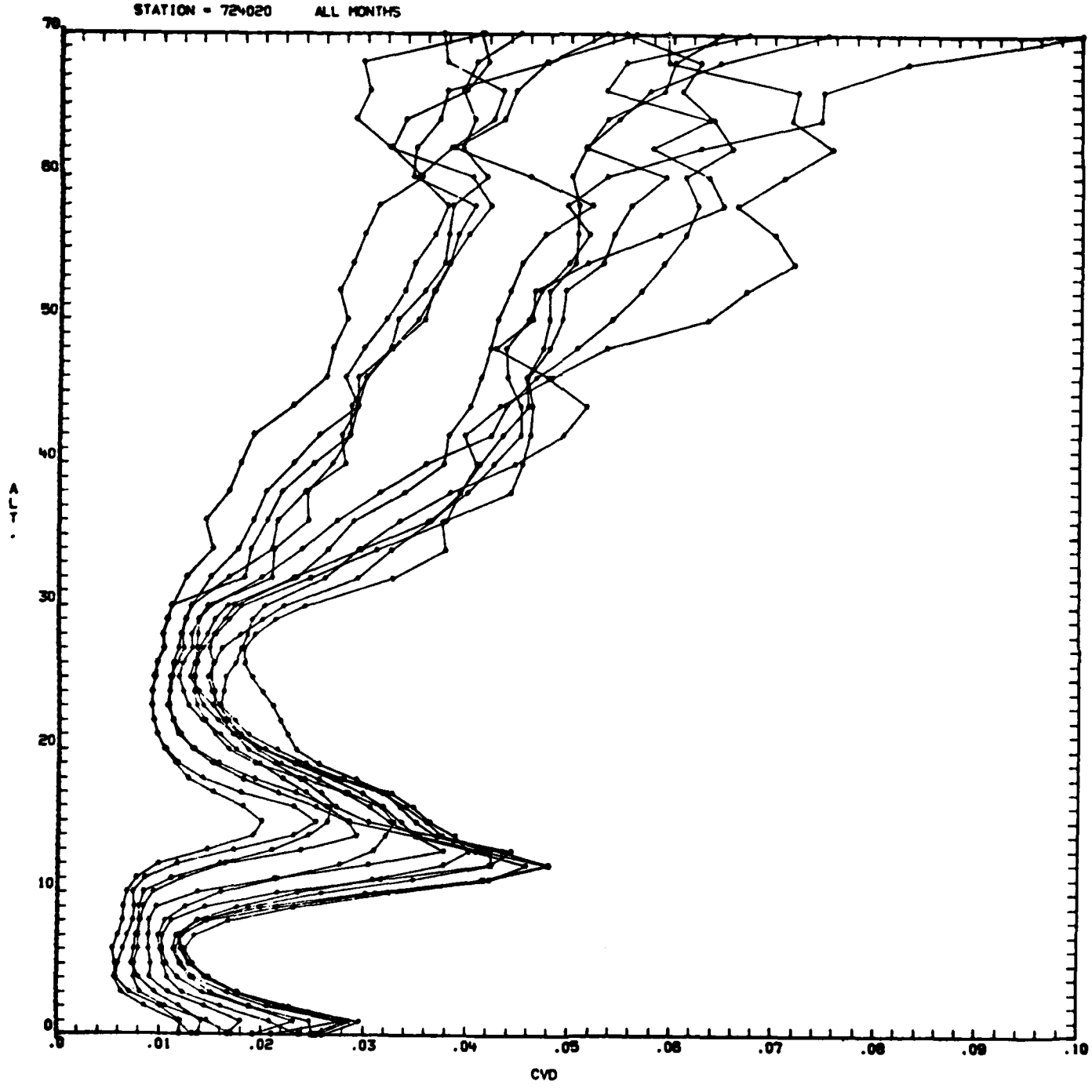
STATION = 724020 ALL MONTHS
70
60
50
40
30
20
10
0
ALT.
.0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.10
CVD

Figure B-18.

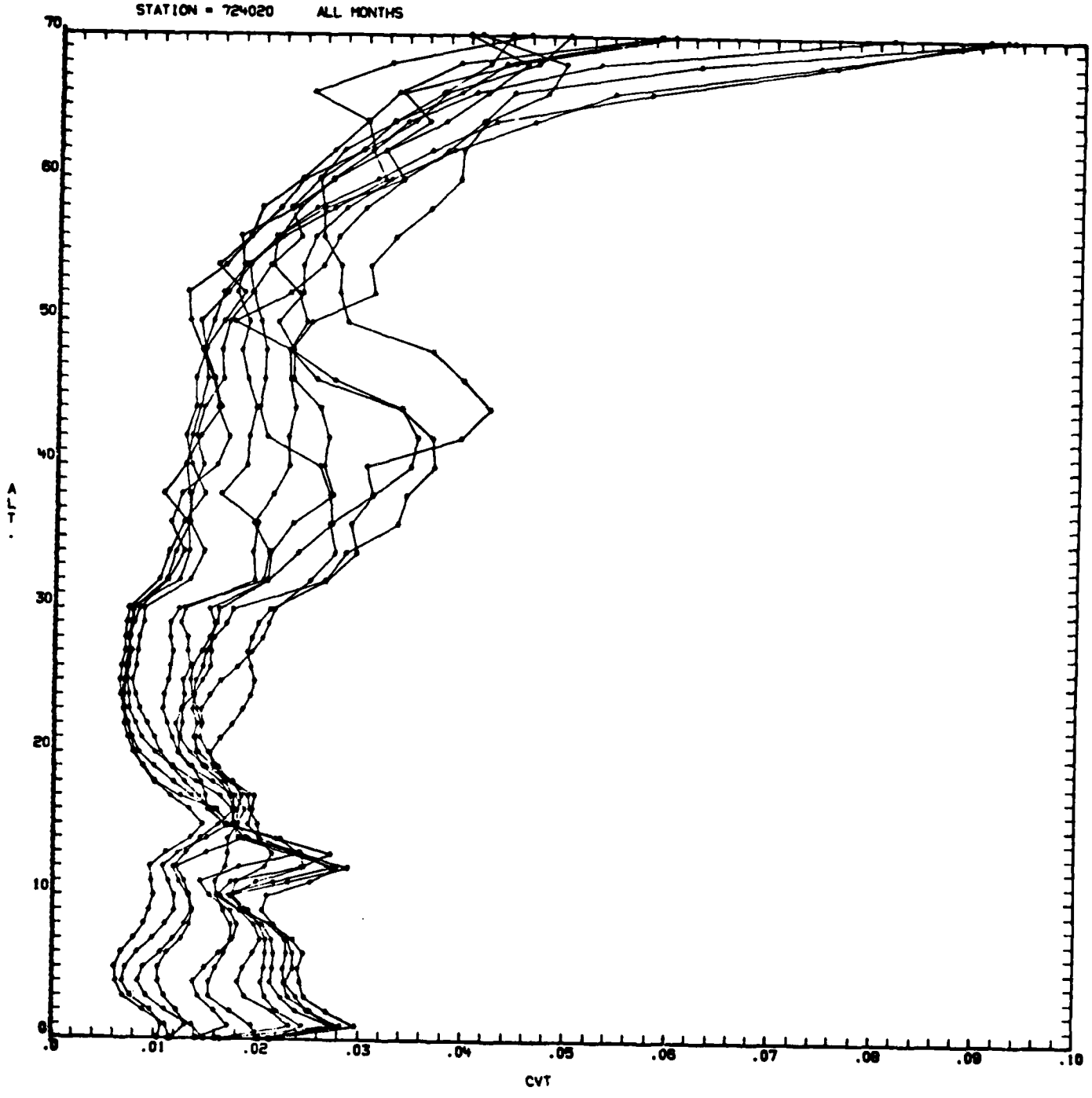
STATION = 724020 ALL MONTHS
70
60
50
40
30
20
10
0
ALT
.0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.10
CVT

Figure B-19.

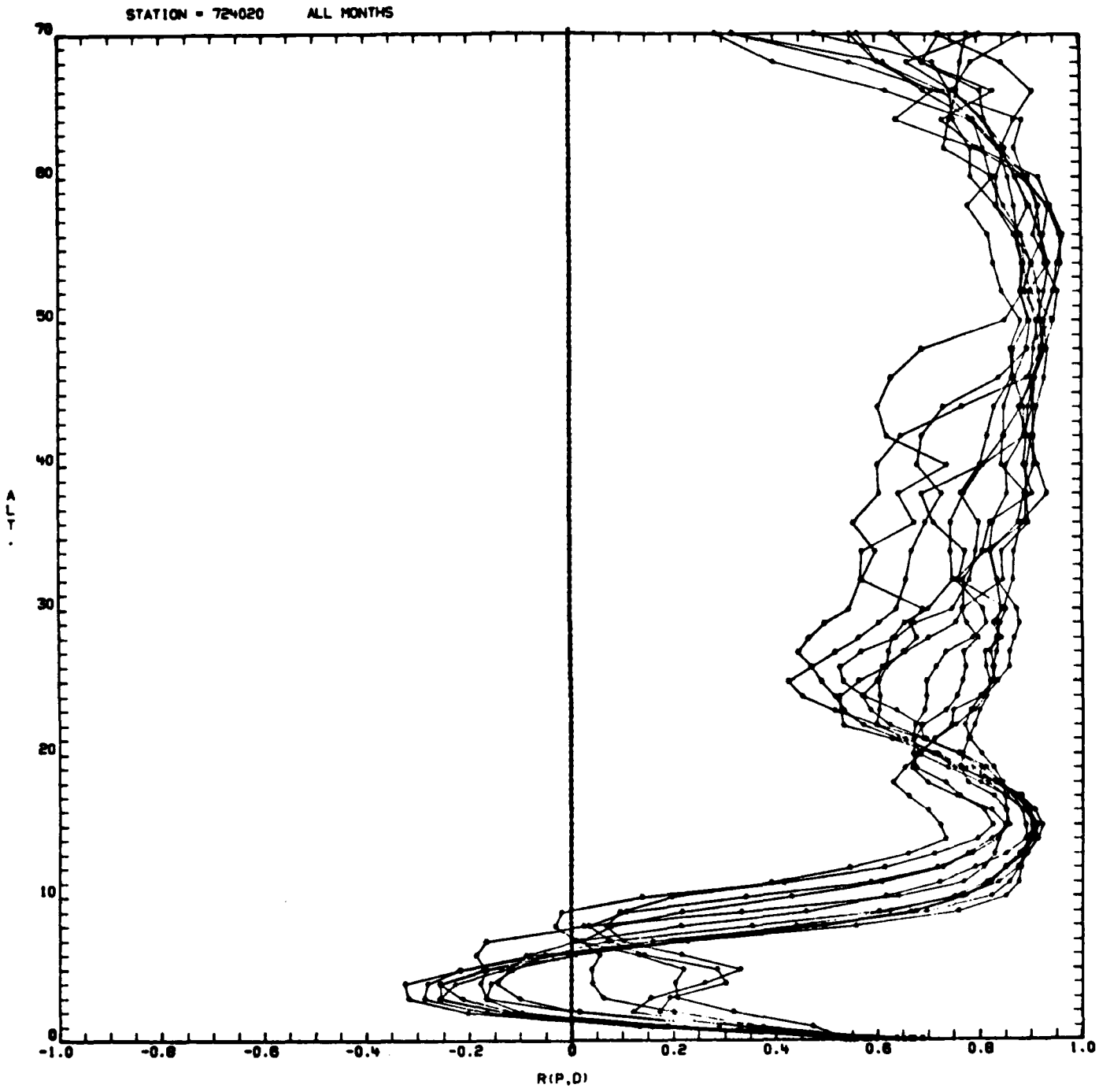
STATION = 724020 ALL MONTHS
ALT.
70
60
50
40
30
20
10
0
-1.0
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1.0
R(P,D)

Figure B-20.

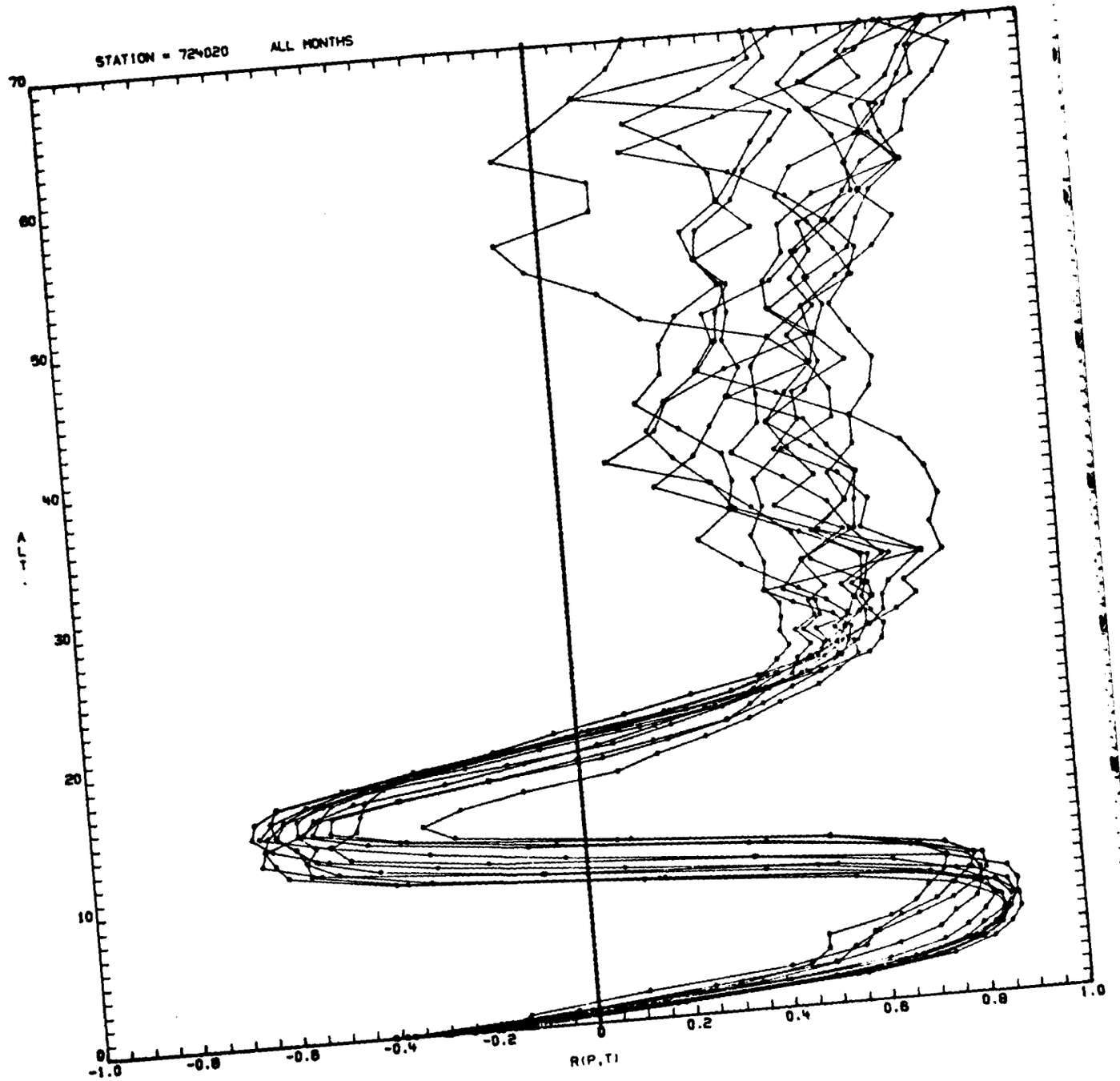
STATION = 724020
ALL MONTHS
70
60
50
40
30
20
10
0
ALT
-1.0
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1.0
R(P,T)

Figure B-21.

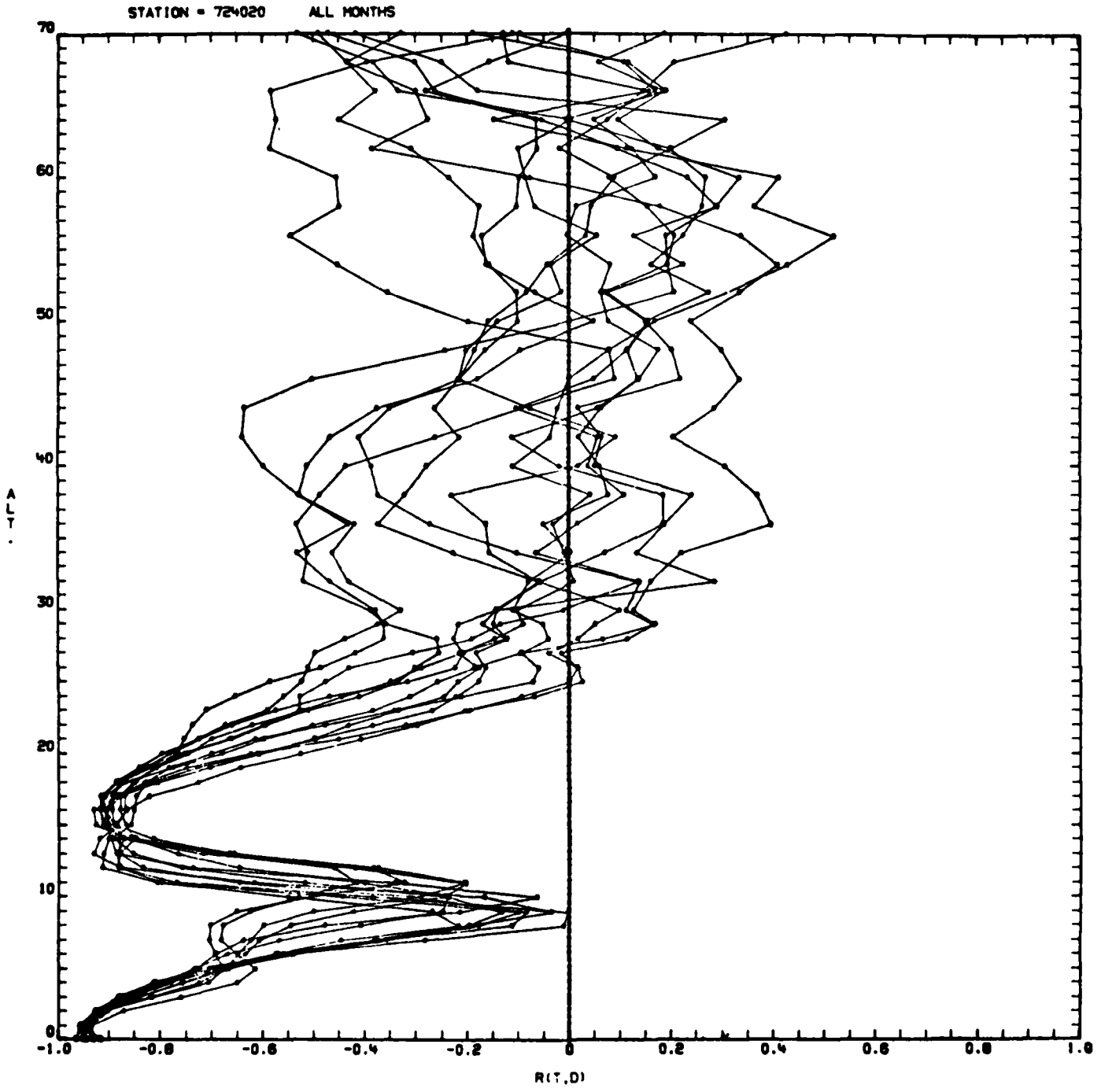
STATION = 724020 ALL MONTHS
70
60
50
40
30
20
10
0
-1.0
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1.0
R(T,D)

Figure B-22.